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CONTENTS.

EDITORIALS.....865
The Electric Range.....865
Danger from Imperfect Earth Connections.....866
The Work of the International Electrotechnical Commission.....866
Rate Regulation by Municipalities.....867
Annual Meeting and Rejuvenation of the Sons of Jove.....868
E. F. Peck.....869
Heany Lamp Case.....869
Corporate Public Relations.....870
Helmholtz Bust Presentation.....870
Further Census Data on Electrical Manufactures.....870
New York Electrical Exposition.....870
Commercial Electrical Apparatus for 100,000-Volt Service—I.—By Stephen Q. Hayes.....871
Wireless Arrangement at Liverpool.....876
Franchise Values Reduced.....876
Copper Exports.....876
International Electrical Congress at Turin, Italy.....876
International Electrotechnical Commission.....880
Three-Cent Rate in Detroit.....880
Waterpower Development at Keokuk, Iowa.....880
Northwest Convention.....880
National Association of Railway Commissioners.....881
National Gas and Gasoline Trades Association.....882
New York Electrical Society.....882
The New Stanley Storage Range.....883
Importance of Proper Description of Merchandise Offered for Exportation.....884
Use of Producer Gas in Texas.—By W. D. Hornaday.....885
Natural Gas for Fuel.....888
Illumination in Europe.....889
October Meeting of Car Lighting Club.....889
Training Commercial Men in the Fundamentals of Illumination.....890
Water Sterilization by the Ultra-Violet Rays.....890
Wireless Telegraphy from Aeroplanes.....891
Telephone Pioneers of America.....891
Wireless System for the Philippine Islands.....892
Wireless in Africa.....892
The Applications of Electricity in the Metallurgical Industry of Italy.—By R. Catani.....893
Ozone in Water Purification.....895
Electric-Railway Construction Active in Spain.....895
QUESTIONS AND ANSWERS.....896
FINANCIAL REPORTS OF ELECTRICAL COMPANIES.....897
NEW ELECTRICAL AND MECHANICAL APPARATUS AND APPLIANCES.....898
CURRENT ELECTRICAL NEWS.....905
PUBLIC SERVICE COMMISSION NEWS.....905
RECORD OF ELECTRICAL PATENTS.....910

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THE ELECTRIC RANGE.

One obstacle to the introduction of electric cooking has been the cost of the electrical energy required. To make the cost reasonable it is necessary to give a very low rate and yet the conditions for a low rate are not usually met in a cooking range for household use. The range would ordinarily be used only a few hours of the day, and would thus have a low load-factor. The maximum demand is high as compared with other forms of household devices. Moreover, the range would very frequently be used in preparing the evening meal at the same time the peak load comes on the central station. It is thus apparent in many cases that the central station cannot give any better rate for current to be used for cooking than for current to be used in lighting.

This objection is overcome in the new range designed by Mr. William Stanley and described elsewhere in this issue. This new range has a small and steady consumption of electric power, thus providing for the central station a load of low maximum demand and high load-factor. The energy thus steadily converted is stored as heat and is available for use when needed. From many points of view this arrangement is admirable—especially from the viewpoint of the central station. From the standpoint of the user, however, it has several disadvantages.

The maximum temperature which can be attained by the range is determined by the equality of heat losses and heat generation. The design is such that this balance is reached at a safe working temperature for the materials used. After this temperature is reached, the entire electrical input is wasted in external losses of heat and serves no useful purpose other than maintaining the apparatus ready for use. In many families this condition would exist during a large portion of the time, especially during the night and in many cases for a number of hours during the day. The user of such an appliance desires to keep down not only the maximum demand, but the total consumption, and such a steady waste will not appeal to him.

This condition also represents at the same time the heating of the room, a condition not desirable in summer, and in conflict with the general claim for electrical cooking that it does not necessitate hot surroundings such as accompany the use of a stove burning gas or other fuel.

To be popular with the consumer the storage principle

should be combined with the best possible insulation, and means provided, either automatic or otherwise, for cutting off the current when the total storage capacity has been reached, rather than to needlessly dissipate the excess of energy. It would be well for the central station, too, if current could be cut off at the time of peak load and the storage capacity utilized to carry on operations over this period. 100-per-cent load-factor only represents the ideal condition for the central station when the entire load is operated upon this basis. When part of the load necessarily has a low load-factor, it is better that the factor for the remainder should not be 100 per cent, provided it can be restricted to the best hours. This condition can be very easily met in Mr. Stanley's range, as it is a simple matter to provide for cutting off current at the time of peak load.

In designing a stove which is to utilize the storage principle it would seem advantageous to make use of some material whose melting point is in the neighborhood of the maximum temperature which it is desired to attain, and thus utilize the benefit arising from the phenomenon of latent heat. If a substance can be secured having a high heat of fusion it would be possible to store a considerable quantity of heat and to give it out again with very little change in the temperature of the range. Unfortunately those metals having low melting points, such as lead, tin and bismuth, are also the ones having low heats of fusion and they are consequently not very well adapted to this purpose. On the other hand it is quite possible that some chemical salt might be chosen which would have desirable properties for this service. Thus, the nitrates of sodium and potassium have melting points somewhat above 300 degrees centigrade and have heats of fusion respectively of sixty-five and forty-nine calories. Probably some substance could be found that would have still better characteristics for this purpose.

The salient feature of Mr. Stanley's design, that the maximum demand shall never exceed 500 watts, is a very important and valuable feature to the central station, and it is highly desirable that this feature be introduced and retained in electric cookers regardless of whatever other modifications may be made.

DANGER FROM IMPERFECT EARTH CONNECTIONS.

The necessity for having ground connections of low resistance is very generally recognized, but it is not always that the desired object is achieved. Too much care cannot be given to securing a good earth connection for all conductors which are, or should be, grounded. This is especially true in low-voltage secondary circuits, where bodily contact is liable to be frequent. It is important, however, that all conductors in juxtaposition to high-voltage lines, but not nominally in connection with them, should be grounded. Death resulted in one case recently from contact with a guy wire which was not well grounded, and to which there was sufficient leakage from the line for a fatal shock.

THE WORK OF THE INTERNATIONAL ELECTROTECHNICAL COMMISSION.

At the session of the International Electrotechnical Commission held in Turin, Italy, last month in connection with the International Electrical Congress, a number of important conclusions were reached.

One important matter was the acceptance by the Commission of the responsibility for the calling of all future International Congresses dealing with the subject of electricity. It is a matter for general satisfaction that this function has been put in the hands of a permanent body, international in character, which will guarantee that there is continuity in effort and a regularity in the time of holding successive congresses. It has already been decided to hold the next International Electrical Congress in San Francisco in 1915, in connection with the International Exposition celebrating the completion of the Panama Canal.

Over a year ago the American Institute of Electrical Engineers passed a resolution requesting the Commission to take some action which would help to secure uniformity in the representation of electrical quantities in vector diagrams. The Commission has had this matter under consideration since the meeting at Brussels last year, and at Turin adopted a definite practice in this connection. The lack of uniformity which has heretofore existed arose from two methods of arriving at the representation of the electrical quantity by the means of vectors. In the one method, due principally to Fleming, the vector was such a quantity that, when regarded as rotating at a uniform velocity, its projection upon a fixed line would represent at any time the instantaneous value of the quantity. This method has been in general use in England, France, and to a large extent in this country. The other method was based upon the use of polar co-ordinates and the vector used to represent an electrical magnitude was the line forming the diameter of a polar diagram, so drawn that its intercept on a radius vector represented the instantaneous value. In this case the radius vector was assumed to have uniform rotation. This method has been largely used in Germany, and has come into considerable use also in this country, largely on account of its having been used in the several treatises published by Dr. C. P. Steinmetz. In both methods the same direction of rotation is made use of, and consequently it is hard to give any preference to one method or the other on a purely logical basis. Yet the two result in different representations of the phase angle. In the former method a positive angle represents lead, in the latter it represents lag. Uniformity of practice in drawing diagrams is greatly to be desired and the Commission has consequently adopted a definite method for the representation of electrical magnitudes by vectors. The method adopted requires that a leading current shall be drawn in advance of the corresponding electromotive force in the direction of posi-

tive angles, that is, counter-clockwise. A lagging current on the other hand will be displaced from the corresponding electromotive force in the negative direction of rotation. While some inconvenience will be experienced in meeting this requirement, since it will be necessary to reprint some of the literature now extant, it is greatly to be hoped that this method will meet with universal use in the future.

Another important decision of the Commission was in regard to symbols. Those symbols which were provisionally adopted at Brussels last year were permanently adopted and in addition the letters *I* for current and *R* for resistance were also agreed upon. In this country both of these letters have been in fairly general use, although current has also to a large extent been represented by the letter *C*. Thus, for instance, the emblem of the National Electric Light Association consists of the equation $C = E/R$. In England the use of *C* has been quite general, and on the other hand in Germany resistance has been universally represented by the letter *W*. It is a matter of congratulation that there has been a willingness upon all sides to sacrifice some present usage for the sake of international uniformity and hereafter we may confidently expect that all electrical equations written in any language will be comprehensible to everyone reading them. While it is to be hoped that the National Electric Light Association in this country will make use of the new symbols it is hardly necessary for it to change its emblem, which will still retain its historical significance.

Another recommendation of the Commission is that the rating of electric motors be expressed in kilowatts instead of horsepower. This recommendation is hardly likely to prove popular, unless the expression for power is in all cases similarly put in terms of the kilowatt. If the horsepower is to be used in connection with the measurement of mechanical energy it will be most convenient to speak of the output of motors in the same terms.

RATE REGULATION BY MUNICIPALITIES.

The question of central-station rate regulation by municipalities is not as yet one of serious import to the electrical industry as a whole, but its appearance in sporadic cases threatens the stability of public utilities in states which have thus far failed to establish regulating commissions endowed with rate-fixing powers. Opinions of utility managers may properly differ concerning the advantages of rate supervision, but if such regulation is to be established, there can hardly be two minds about the importance of handling it on a state-wide basis, rather than allowing a city or town government to determine prices for electrical energy sold within the community.

The reasons are not far to seek, but they are worth bearing in mind when an attempt is threatened to place rate adjudication upon the shoulders of municipal authorities. Primarily, rates should be passed upon by a disinterested tribunal, and a board of aldermen, council or municipal commission living to a man in the community where the rate issue is raised, inevitably must be biased in sitting upon a matter of this character; the political future of each board member hinges more or less upon his finding; and again, local prejudices are bound in the great majority of cases to warp the fairness of the decision. In the second place a municipal governing body of changing composition and uncertain tenure of office rarely possesses a single member qualified by technical training and experience to determine the equity of electric-service rates and street-railway fares. This line of work demands the most profound study of experts acquainted with large administrative and financial problems, men familiar, at least, with the underlying principles of electrical production and distribution and capable of weighing the evidence of specialists in every department of the industry. It has taken the older state commissions a long time to reach the point where such a study is given as a matter of course to each and every rate case brought before them, and it will take some of the younger boards not a few years yet to acquire the combination of judicial and technical ability demanded for work in this exacting field.

The expansion of central-station service into fields extending far beyond the limits of single cities renders a piecemeal adjustment of rates by a local body of limited observation little less than farcical. More and more the tendency is for rates to be equalized for given demands and consumptions of energy all through the varied territory of each growing company. This means that small communities are being brought into great distributing systems to enjoy the same advantages of price that were formerly offered by city companies, and these communities also are in line to reap the benefit of all subsequent rate reductions. To take a single case, the existence of a system rate for power throughout an area of scores and sometimes hundreds of square miles enables a manufacturer to locate in some suburban town where land is cheap, and enjoy the same rate for electrical service that he would have to pay if his establishment fronted on the central part of the commercial capital of the district. The benefits accruing to the small community from the establishment of such a plant far offset any advantages which it could gain by the local adjudication of rates, even assuming that the local municipal authorities were qualified to sit upon such complex and difficult matters.

In the few instances where municipal rate regulation has been advocated and put more or less into practice, it appears that the only redress for the public-utility company lies either in a repeal of the law giving the municipality rate-making powers, or else in a resistance from court to court on the ground of confiscation. It may cost something to assemble the data to prove that a given assault on rates by a municipal tribunal is confiscatory, but the company that fights such a case through the courts, will render a great service.

ANNUAL MEETING AND REJUVENATION OF THE SONS OF JOVE.

ROBERT L. JAYNES ELECTED JUPITER AFTER EXCITING CONTEST.

At the ninth annual rejuvenation of the Rejuvenated Sons of Jove held last week at Denver during the progress of the second annual electrical show of the Colorado Electric Club, Robert L. Jaynes, of Pittsburg, succeeded J. Frank Dostal of Denver to the highest office in the order. Mr. Jaynes was elected Tenth Jupiter and Pittsburg secured the tenth rejuvenation of the Jovians.

The election of Mr. Jaynes and the campaign which resulted in that end being accomplished was one of the most intensely contested in the history of the organization. The spectacular campaign of J. Frank Dostal of 1910 was tame compared with the fight which marked the election of the Tenth Jupiter. As will be remembered the Denverites surprised the delegates to the Eighth Rejuvenation held in Birmingham, Ala., in 1910, by flooding the convention with telegrams urging the congress to elect J. Frank Dostal, of Denver, as Ninth Jupiter and select Denver as the 1911 meeting place. The contest of Mr. Jaynes was altogether different and marked an epoch in the history of the organization which will be long remembered by those who were in attendance at the convention at Denver.

It was evident from the start that the fighting squadron from Pittsburg would be victorious, but nevertheless Washington Devereux, of Philadelphia, was an intensely active contestant for the honor bestowed on Mr. Jaynes. The morning session of Wednesday, October 18, was one of the most interesting the order of Jovianism has ever held and every particle of campaign oratory ever invented was injected into the contest. Before long it was obvious that the Philadelphia delegation could not survive the morning and after a session lasting four hours Jaynes was unanimously elected.

The Pittsburg delegation and Mr. Jaynes promise much in the way of entertainment at the 1912 convention at Pittsburg. According to the statements made at the annual banquet held at the Brown Palace Hotel, Denver, on Wednesday evening, October 18, the next year will see the most successful rejuvenation and convention ever held by the order.

The administration of J. Frank Dostal was one of the most successful in the order's history and at the annual initiation which took place at the El Jebel Temple, Denver, Tuesday evening, October 17, one hundred and eleven candidates were received into the organization. Much credit is due Mr. Dostal and Harry C. Biglin, Colorado statesman, for the success of the Denver convention and the material addition to the association's membership. The Denver class, it is said, was the largest ever received into the order at one time. The initiation, too, was one of the most interesting ever witnessed, and the entertainment during the week was pronounced by all the attending Jovians as without an equal. The degree team was composed of the following: Jupiter, George C. Richards; Neptune, Benedict Shubert; Pluto, Frank P. Cummings; Vulcan, Henry F. Holland; Mercury, Geo. N. Robinson; Hercules, W. A. Carter; Mars, E. D. Strickland; Appollo, E. M. Sexton; Avrenim, A. F. Traver.

At the annual banquet the speakers were unanimous in their prediction that the Pittsburgers would have to "go some" to eclipse the record set by the Denver contingent. There were about 300 Jovians in attendance at the annual banquet. The candidates taken into the order the night before were the guests of honor. The evening was given over to singing and speech making between the regular courses of the dinner. Loving cups were presented to Mr. Jaynes and Mr. Dostal, the former receiving his in acknowledgment of the campaign inaugurated by the Pittsburg delegation. Mr. Dostal received his as an appreciation of the good work accomplished by the order during his reign as Jupiter.

A most unique and elaborate program was prepared for the dinner which included short biographies and sketches of the gods of the order of Jovianism. Thomas F. Kennedy, of Denver, was given an ovation by the diners for the novel and interesting program which was prepared by a committee headed by him.

The toasts were arranged as a baseball scoreboard, entitled the "World's Series at Mount Olympus. Batting Order." The umpire was "Jack" Greenawalt, of Denver. The batting order was Devereux, pitcher; Turner, catcher Frueauff, first base; Parr, second base; Dostal, third base; Van Vleet, short stop; Biglin, left field; Bennet, center field, Matthews, right field, for the Sons of Jove, the name given this team; the "Earth Born," by which the opposing side was known, comprised the following: Jaynes, pitcher; Holland, catcher; Hite, first base; Hobson, second base; Richards, third base; Kirkland, short stop; Beattie, left field; Strickland, center field, and Gilbert Smith, right field.

The cover design for the banquet program was designed by Frank Finch, a well known Denver cartoonist.

In responding to toasts the various speakers were loud in their praise for the Denver section of the order and contended that a more hospitable and active section was beyond their knowledge until they came to Denver and learned conditions there.

Robert L. Jaynes, Tenth Jupiter, made a host of friends while in Denver and from indications the Pittsburg convention should be the most notable and also one of the largest attended.

Mr. Jaynes has been an active member of the order for the past five years and as Statesman for the Pittsburg district, brought 260 new members into the order. He assured 1,000 more would be added during the Pittsburg convention in 1912. It is said that there are 20,000 electrical men in his district.

Mr. Jaynes was born in Quincy, Ill., in 1866, to which town his family had gone from Spottsylvania County, Va. He was educated in public schools and early in life became an electrician. He has for a number of years resided in Pittsburg, as selling agent for a number of manufacturers of electrical supplies, including the Hart Manufacturing Company, the American Conduit Manufacturing Company, and the Bossert Company.

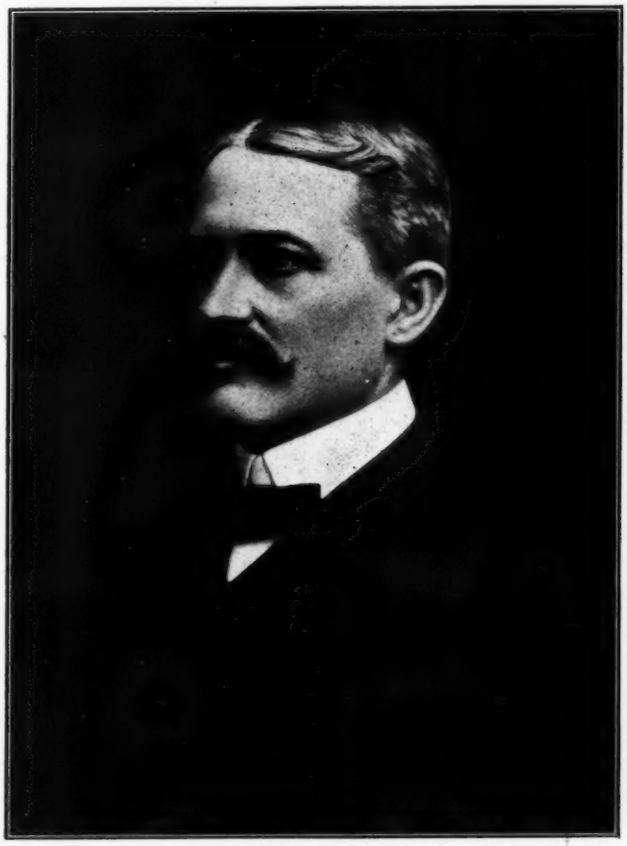
The officers of the Rejuvenated Sons of Jove elected at the Denver convention to serve for one year are: Robert L. Jaynes, Jupiter; Henry E. Hobson, Dallas, Texas, Neptune; Harry C. Biglin, Denver, Pluto; George H. Porter, Chicago, Vulcan; Walter N. Stearns, Atlanta, Ga., Hercules; Herbert H. Cudmore, Cleveland, Mars; William J. Grambs, Seattle, Wash., Apollo; C. McKew Parr, Hartford, Conn., Avrenim; Eli C. Bennett, St. Louis, Mercury.

E. F. Peck.

To those of our readers who have followed the fortunes of those most conspicuously interested in the development of the electric lighting and electric railway industry during the past thirty years, no one is more familiarly known nor highly esteemed than E. F. Peck, the subject of this sketch. True he was a youngster in the young days of electric lighting, but he was a youngster with brains and terrific energy, and some of the things he did in holding down the business of the old lighting company in Brooklyn, N. Y., established for him a splendid record and made him a substantial figure in the later days when things came easier and emoluments ran to better figures.

Edward F. Peck was born in New Britain, Conn., March 8, 1861. He attended the public schools of New Britain, graduating from the New Britain High School in 1880. After leaving school he entered the employ of the American Electric Company, which subsequently became the Thomson-Houston Electric Company, eventually becoming electrical expert for this institution. Mr. Peck remained with the Thomson-Houston Company as expert during its various stages of development until 1885. In this time he was engaged in constructing electric light plants in Boston, Fall River, Lynn, and Haverhill, Mass.; Columbus and Springfield, Ohio; St. Louis, Mo.; and Brooklyn, N. Y. He also had charge of the exhibitions of the Thomson-Houston Company at Boston, 1882, Cincinnati in 1883, Philadelphia in 1884 and New Orleans in 1884 and 1885. Shortly after the New Orleans exhibition in 1885, he accepted the position of general superintendent of the Citizens Electric Illuminating Company, of Brooklyn, and from 1897 until 1899 was in the electrical engineering and supply business in New York City. In 1899 he was appointed general manager of the Kings County Electric Light & Power Company of Brooklyn, holding that position until 1902 when he became general manager of the Schenectady Railway Company, a position he still holds.

As general manager of the Kings County Electric Light & Power Company, Mr. Peck was highly successful, and a large share of the credit of placing this company on a sound operating and financial basis must be given to him. During his connection with the Schenectady Railway company this system has thrived and grown by leaps and bounds. It was the pioneer in the introduction of many features now recognized as standard in high-speed electric railroading, and its track system and power houses are models of their kind.



EDWARD F. PECK,
General Manager of the Schenectady Railway Company.

During 1909 and 1910 Mr. Peck was president of the Street Railway Association of the State of New York and at present is a member of its executive committee. He is also a member of the American Institute of Electrical Engineers, the New York Electrical Society, and the Transportation Club of New York.

Heany Lamp Case.

About four years ago John Allen Heany, of York, Pa., and his patent attorney, and a young assistant examiner in the Patent Office, were indicted on charges of fraud and conspiracy in altering certain patent applications of Heany, then pending in the Patent Office in an attempt to introduce into them inventions relating to tungsten incandescent lamps which had been made by others, information with respect to which, it was alleged, had been fraudulently obtained through the assistant examiner. On the trial the assistant examiner pleaded guilty and the attorney was tried and convicted, both being sentenced to imprisonment, and Heany was acquitted.

We now learn that on the termination of the criminal proceedings the Commissioner of Patents caused an investigation to be made with the object of ascertaining whether the fraudulent alterations in the application were made with the knowledge or connivance of Heany. It was interrupted by a proceeding filed by Heany and the Heany Lamp Company, in the courts of the District of Columbia, in an attempt to enjoin the investigation. An injunction was issued by the lower court, but was set aside by the Court of Appeals, and investigation was then resumed. Testimony was taken and a full opportunity afforded to Heany and his associates to put in a defence. The decision of the Commissioner of Patents by the Hon. C. C. Billings, assistant commissioner of Patents, has now been handed down, holding that the applications of Heany pending in the Patent Office involved in the investigation had been tampered with and that among other things two sheets of paper on which the specification of one of the important cases was written had been abstracted and two other sheets substituted in place thereof; that this was done in pursuance of a conspiracy to fraudulently secure patents which would control the tungsten-lamp busi-

ness, and that Heany was a guilty party to the conspiracy. The commissioner has ordered that certain pending interferences in which these applications under investigation were involved be dissolved as to the party Heany; that the Heany applications referred to be finally rejected on the ground of fraud, and that an endorsement to this effect be made on the applications and that they be removed from the files of the active cases of the office.

Corporate Public Relations.

At the meeting of the Electric Club, Chicago, on October 25, an address was made by H. O. Seymour, of the Chicago Telephone Company, on "Corporate Public Relations."

Mr. Seymour confined his remarks to public-utility corporations, and stated that the relations between such corporations and its patrons should be the same as in the case of any other business. The patrons' demands are the same, good service, fair prices, and an explanation for the existing prices and any failures of service. The question of rates is the source of the most friction, and now that going value, depreciation, and other intricate considerations enter into rate-making, it has become more difficult to make the basis of rate-making clear to the suspicious public.

The speaker then discussed watered stock and bonuses, and made a plea for the justice of large returns to the early promoters and pioneers who took chances in introducing the telephone and other utilities in the early years of those enterprises.

Kempster B. Miller opened the discussion and took issue with Mr. Seymour's statement that public-utility companies and others having monopolies should have the same relations with the public as private enterprises subject to competition. He then spoke of the telephone situation in Los Angeles, where the city is trying to do the right thing but has been in doubt as to what is right and just. He also emphasized the extreme difficulty of making evaluations of properties as a basis for rate-making.

G. B. Foster spoke on the necessity of educating the public to an appreciation of the actual facts, and W. R. Abbott stated that he had invariably found the public reasonable when all facts were fully brought out.

President Homer Niesz closed the discussion by calling attention to the admirable attitude of the Chicago public-utility corporations, which are always ready to meet customers more than half way in adjudicating differences.

Further Census Data on Electrical Manufactures.

A preliminary statement of the data on electrical manufactures in the year 1909, as determined by the thirteenth United States census, was given in these columns in the issue of September 9, 1911. At the request of the leading electrotechnical journals and the principal electrical manufacturers the Census Bureau has furnished supplementary data on the subject. These additional statistics are subclassifications of some of the data for 1909, as given in the first column of figures on page 518 in the issue referred to. The supplementary figures are as follows:

ITEMS.	No. of establishments Reporting.	Number manufactured in 1909.	Total rating.	Value.
Dynamos:			Kilowatts.	
Direct current	75	13,882	414,222	$4,711,000
Alternating current	28	2,909	991,728	8,370,000
Dynamotors, motor-generators, boosters, rotary converters, and double-current generators	29	2,291	295,079	3,155,000
Transformers:				
Fifty kilowatts and over	14	3,953	1,058,021	4,616,000
Under fifty kilowatts	31	72,776	577,408	4,185,000
Motors:			Horsepower.	
Direct current for power	93	100,714	676,682	7,787,000
Alternating current for power	45	143,409	1,006,995	10,519,000
For automobiles	8	2,796	12,471	294,000
For fans	32	199,113	178,033	2,451,000
For electric elevators	22	4,988	63,585	1,189,000
For railways and miscellaneous, including parts and supplies	..	53,710	795,652	9,847,000
		Weight of plates (pounds)		
Storage batteries	68	23,119,331	.....	4,244,000
Parts and supplies	..	.....	.....	434,000
Primary batteries:		Numbers		
Liquid and testing	11	344,650	.....	729,000
Dry cells	43	33,988,881	.....	4,583,000
Parts and supplies	18	.....	.....	622,000
Arc lamps:				
Open	10	5,064	.....	84,000
Inclosed	23	118,981	.....	1,623,000
Incandescent lamps:				
Carbon filament	43	55,048,378	.....	6,157,000
Tungsten	20	11,738,619	.....	6,241,000
Gem, Tantalum, glower, vacuum and vapor lamps	..	.....	.....	2,716,000
Decorative and miniature lamps, X-ray bulbs, vacuum tubes, etc	16	.....	.....	601,000
Telegraphs:				
Intelligence	6	83,539	.....	198,000
Police	17	.....	.....	1,127,000
Wireless apparatus	23	.....	.....	448,000
Switchboards and telegraph parts and supplies	15	.....	.....	185,000
Telephones:				
Transmitters	27	1,116,403	.....	1,377,000
Receivers	31	1,063,309	.....	1,135,000
Complete sets of instruments not included in transmitters and receivers	52	732,697	.....	5,104,000
Interior systems complete without instruments	12	16,238	.....	123,000
Central switchboards	27	36,272	.....	2,399,000
Private exchange boards	11	2,252	.....	376,000
Parts and supplies	48	.....	.....	3,752,000
Electric heating, cooking and welding apparatus	..	.....	.....	1,003,000
Electric measuring instruments:				
Station apparatus	21	.....	.....	1,639,000
Testing and scientific	37	.....	.....	547,000
Meters for consumers' circuits	15	.....	.....	5,614,000

Twenty establishments reported the manufacture of electric heaters including those for cars; thirteen made electric cooking stoves, and four made electric welding apparatus. The total output of all these was $1,003,000.

New York Electrical Exposition.

The recent New York Electrical Show has been such an unqualified success that the management has decided to hold an Electrical Exposition and Automobile Show from October 9 to 19, 1912. This show will be held in the Grand Central Palace where this year's exposition was held. A number of exhibitors have already contracted for space next year. Some of them are taking more space than was used this year.

Helmholtz Bust Presentation.

An excellent bronze bust of the great German scientist, Hermann von Helmholtz, has been presented to the American Institute of Electrical Engineers by Edward D. Adams. A public acknowledgment of this valuable gift to the historical collection of the Institute, will be a feature of the Institute meeting in New York, November 10, 1911. It is expected that Mr. Adams, the donor, will be present at this meeting, and arrangements have also been made for an address in behalf of the Verband Deutscher Electrotechniker by Adolf Franke, who is at present in this country, and who was a student under Helmholtz.

Commercial Electrical Apparatus for 100,000-Volt Service.—I.[1]

BY STEPHEN Q. HAYES.

It has been the writer's aim to give in this paper as much general information relative to a very broad subject as can be compressed into an article of moderate length. This condensation makes it necessary to touch but lightly on certain subjects and completely pass over others that may be of vital interest to some engineers.

Electrical engineers are familiar with commercial electrical apparatus for moderate voltages, so this paper refers to apparatus for voltages of 100,000 or above. To eliminate theoretical conditions and appliances this paper confines itself to commercial electrical apparatus already operating, built or designed for actual or proposed power-transmission systems, with which the writer is personally familiar.

The general trend of electrical pressure for power-transmission service is ever higher and higher and while there are at present comparatively few plants in actual service or designed for operation at 100,000 volts or above, their number is increasing continually. As the market for electrical power grows, nearby water powers are all utilized, and the distance from a market to a suitable source of power increases.

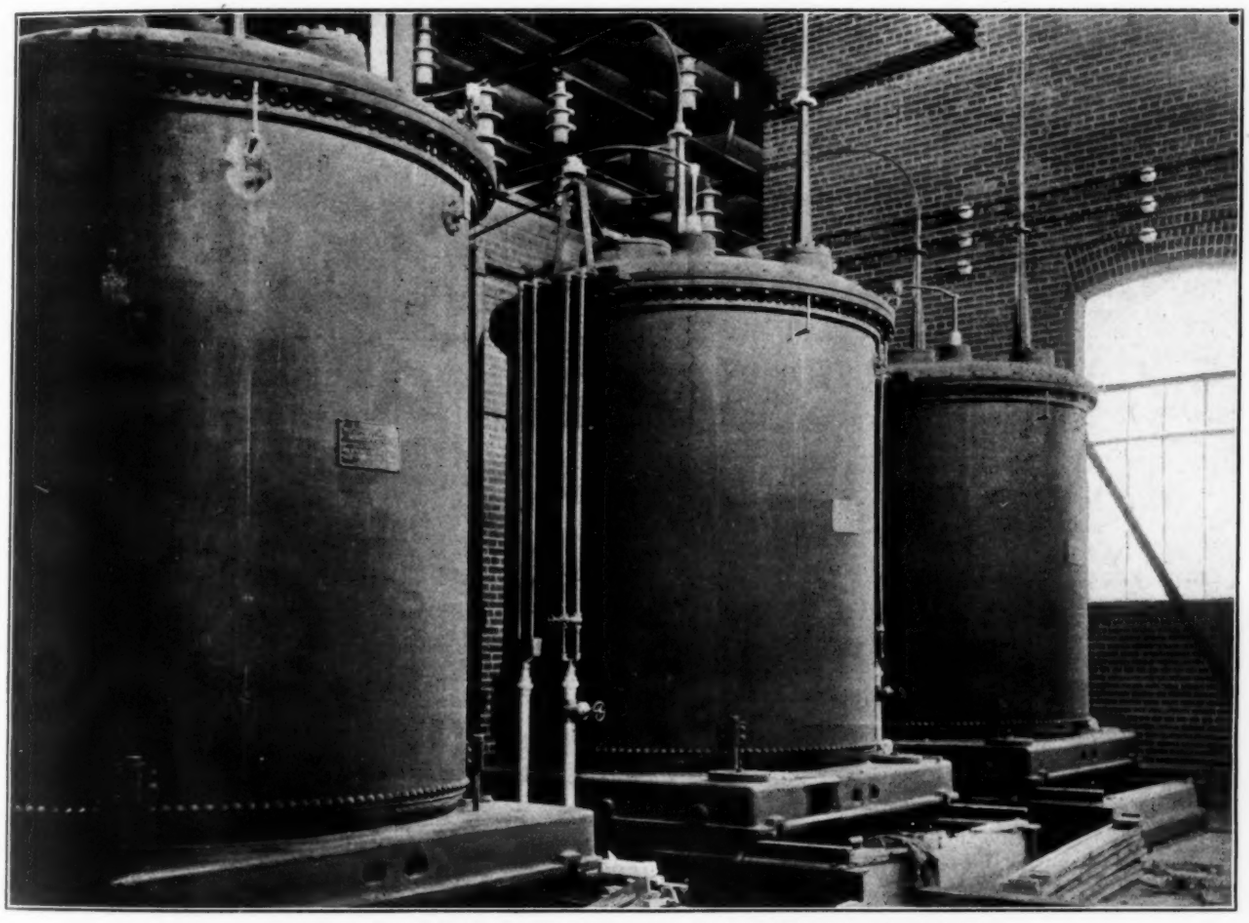


FIG. 1.—WATER-COOLED SINGLE-PHASE TRANSFORMERS INSTALLED.

While high-voltage direct current has been used to a slight extent for power transmission, practically all high-voltage systems of any importance use three-phase alternating current and the success of this system depends primarily on the following apparatus: transformers for developing and using the high tension, terminals suitable for high-tension apparatus, circuit-breakers and switching appliances for controlling the high tension, lightning arresters and protective devices for the high tension, station arrangements suitable for high-tension installations, transmission lines for the high tension.

TRANSFORMERS.

Transformers, as well as other electrical apparatus, develop heat during their operation, and various means have been adopted for dissipating this heat. Owing to the difficulty of securing satisfactory insulation without the use of oil, for voltages of 100,000 and above, all such transformers are made oil-immersed and are arranged for natural oil cooling or artificial oil cooling depending on their size and other considerations.

Natural oil cooling takes place when a transformer is immersed in oil and provided with a case having a sufficient radiating surface to dissipate the heat brought to it by the oil. Transformers of this type have numerous ducts extending through the openings in the

[1] Paper read at International Electrical Congress, Turin, Italy, slightly abridged.

iron from one end of the coils to the other, and similar ducts between the laminations to permit a circulation of oil throughout the interior of the transformer. Using cases with plain boiler-iron tanks or deep corrugations, the maximum size of transformers that can be made of self-cooling type is about 1,000 kilowatts, but by adopting the tubular construction illustrated in Fig. 2, transformers can be made self cooling up to 3,500 kilowatts, or even larger.

For still larger sizes artificial oil cooling is adopted and the method in general use for cooling the oil is to place one or more coils of seamless tubing under the oil in the top of the transformer case near the walls of the tanks and to circulate water through these coils to remove the heat from the oil and to promote the circulation of the oil. The limit of size for transformers is largely a question of shipping facilities or the building up of the transformer at destination, transformers having been designed in capacities up to 14,000 kilowatts.

The question of relative advantages of three-phase or single-phase transformers may be summed up by stating that three-phase transformers of moderate size when compared with single-phase units of the same total capacity have the advantage of lower cost, higher efficiency, small floor space, less weight, simpler wiring, reduced freight and erection charges, while the main disadvantages are the greater cost of spare units and repairs. Allowing a spare unit in each case for one or two circuits, single-phase units have the advantage in price of transformers, while for three or more circuits, the three-phase units have the advantage.

Where the capacity, however, of the three-phase transformer or a bank of single-phase transformers is in the neighborhood of 10,000 kilowatts, the weight and size of the three-phase units makes it difficult to ship, erect and handle, and for such capacities single-phase units are frequently advisable.

The relative advantages of star and delta connection for transformers have been pretty thoroughly discussed at various times and seem to be reduced to these features. With delta connection, one set of coils in a three-phase transformer or one of a bank of three single-phase transformers can be cut out of circuit, and the remaining two can then be connected in open delta and deliver approximately fifty-eight per cent of the output of the bank with the same heating. With star connection the voltage on any one transformer is only 0.58 of the voltage between lines, and the neutral point is available for grounding, inserting series transformers, or other purposes. The question of using star connections and grounding the neutral solidly or through a resistance is a much mooted one and the practice of some engineers, particularly for extremely high voltage, favors the star connection with neutral grounded through a resistance that would limit the current to flow through a grounded line to three or four times the normal full-load current of the transformers connected between that phase and the ground. Other engineers of equal note recommend delta connection and ungrounded circuits.

With a solidly grounded neutral every additional ground on the transformers, line, etc., develops immediately into a short-circuit which in turn causes severe mechanical stresses on the windings of the transformers and generators as the probability of severe and destructive arcs is much greater on a grounded than on an ungrounded system. Grounding the neutral point of the star connection, however, limits the voltage between any conductor and ground to fifty-eight per cent of the normal voltage between conductors, and for extremely high voltage, this is often of the utmost importance in limiting the insulation strain of the transformers, switching devices, protective apparatus, and transmission line. As far as protection to the apparatus is concerned, the advantages of solidly grounding the neutral far outweighs the disadvantages.

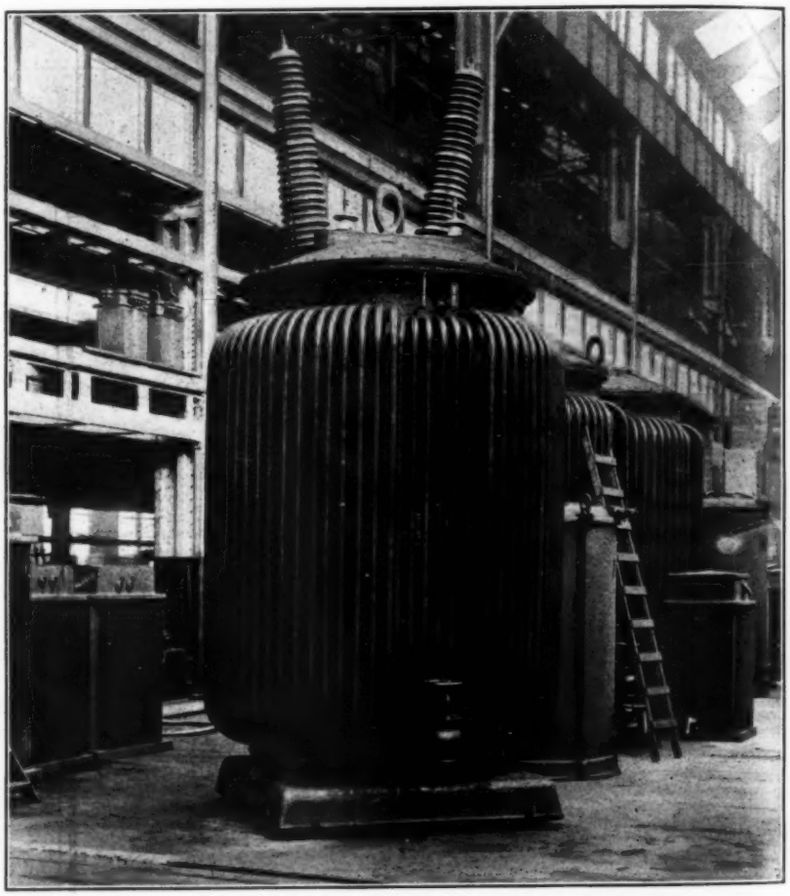


FIG. 2.—SELF-COOLING OUTDOOR-TYPE TRANSFORMER.

As far as the line is concerned, it must be understood that on a grounded neutral system every ground on a line wire immediately results in a short-circuit and the resulting arc will continue until the power on that section of the line is cut off. If there are only one or even two transmission lines connecting the generating station with the point of distribution, the resulting shut down of the line due to a ground on one phase wire is of very grave importance, but where there are three or more transmission lines, the shutting down of one line is of comparatively smaller importance. If any arrangement is made for

automatically cutting out a damaged section of transmission line due to insulation trouble, and transferring the load to the other lines, it is feasible to operate with a solidly grounded neutral with little likelihood of complete shutdown due to its use.

In order to give some idea of the various sizes of transformers actually built or designed for service at 100,000 volts or above, some typical examples have been selected, and for the sake of convenience, reference letters have been assigned to them.

FIG. 3.—WATER-COOLED TRANSFORMER ASSEMBLED.

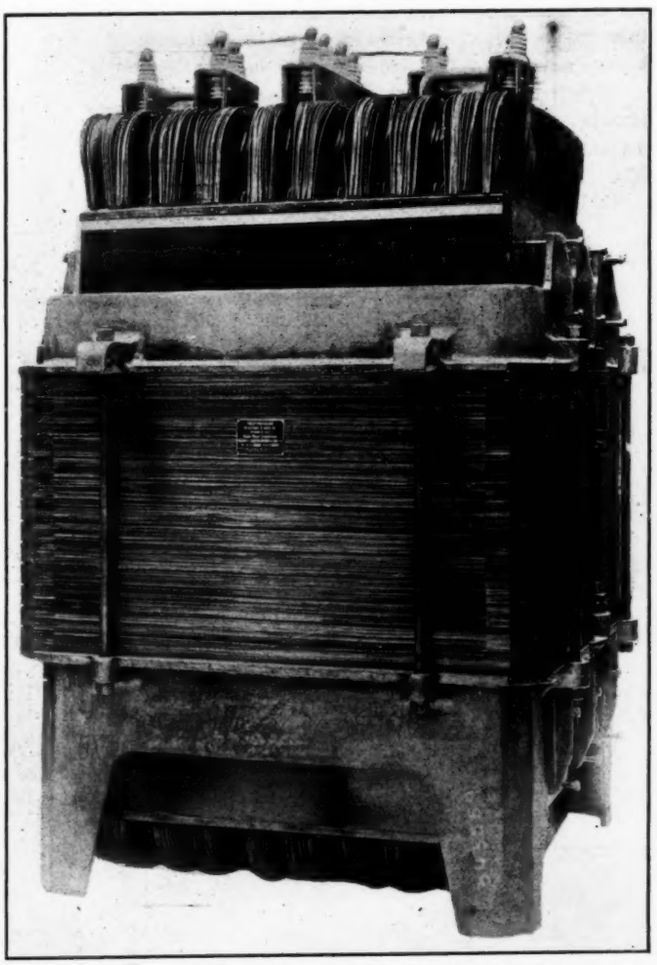


FIG. 4.—COILS AND CORE OF 4,000-KILOWATT TRANSFORMER.

Fig. 2, transformer "A", shows a 1,000-kilowatt, 100,000-volt, 60-cycle self-cooling transformer for outdoor service used on the lines of the Southern Power Company. The most interesting features of this transformer are the tubular construction of its tank to obtain sufficient radiating surface for cooling, and the arrangement of the high-tension leads, which are of the condenser type described later.

Transformer "F" is one of the nine transformers (3,750 kilowatts) used in three banks of three each at Niagara Falls, Ontario, for stepping up the 12,000 volts received from the Ontario Power Company to 110,000 volts for the 25-cycle transmission system of the Hydro-Electric Power Commission of Ontario. Fig. 1 shows a group of these transformers installed and indicates the arrangement of the insulators, copper tubing and connections in the high-tension circuits.

Transformer "G" is one of several groups of three 4,000-kilowatt, single-phase water-cooled transformers used for tying together the 50,000 and 100,000-volt, 60-cycle systems of the Southern Power Company. Fig. 3 shows one of these transformers assembled, while Fig. 4 shows the coils and iron removed from the case.

Transformers "H" and "I" are examples of 3,000-kilowatt, 140,000-volt, 60-cycle, single-phase transformers for the highest voltages actually built or designed for commercial service at the time this paper was prepared—namely 140,000 volts delta. "H" was designed for tying together a 140,000-volt and a 40,000-volt system. To guard against any possible source of trouble that might arise from a connection between the two systems and a ground on one, an insulation test of 380,000 volts was required. "I" was used in a substation where no such condition existed and was tested for 280,000 volts. Fig. 6 shows the main dimensions and the arrangement of transformer "H".

Transformer "K" is one of the four 10,000-kilowatt, three-phase, water-cooled transformers installed in the Baltimore substation of the Pennsylvania Water & Power Company. These transformers, shown complete in Fig. 7, with coils and iron shown in Fig. 8, are at present used on a 66,000-volt circuit, but are tested for 180,000 volts and are insulated so that they could be used satisfactorily on a solidly grounded neutral system with about 140,000 volts between outside wires.

Transformer "M" is probably one of the largest transformers ever designed, having a capacity of 14,000 kilowatts at 110,000 volts, 60 cycles. There is no reason, however, apart from the mechanical difficulties of transportation and assembly, why even larger transformers could not be designed and built, if there were any actual demand for larger units.

All of the transformers described and illustrated above are shell type. The relative advantages of core-type and shell-type transformers are subjects of discussion among engineers and designers and the merits of the two types will not be touched on here. The use of the shell construction for the larger

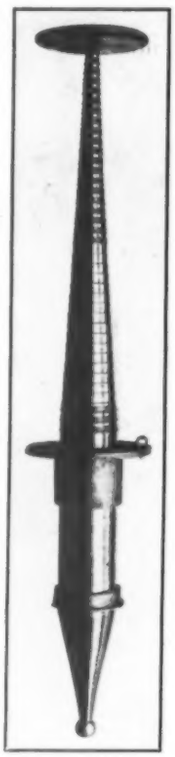


FIG. 5.—CONDENSER BUSHING FOR 300,000-VOLT SERVICE.

transformers given above is the best indication of the opinion of the designers of these particular units regarding this point and a few features of this shell type may be of interest.

Both high and low-tension windings are divided into many flat coils of one turn per layer, the layers separated from each other by heavy insulating material, all of this insulating material being made into sheets, angles, channel forms, etc., so that the proper assembling of the insulation is a comparatively simple matter and repairs can be effected promptly and surely. The turns of the high-tension coils are insulated with heavy sleeving, the turns near the line terminals being extra-heavily insulated. The coils are individually insulated and assembled into groups with strong insulating barriers between them.

Ventilating ducts of ample dimensions are distributed among the coils at frequent intervals to insure a uniform temperature through the interior of the transformers. The core consists of a

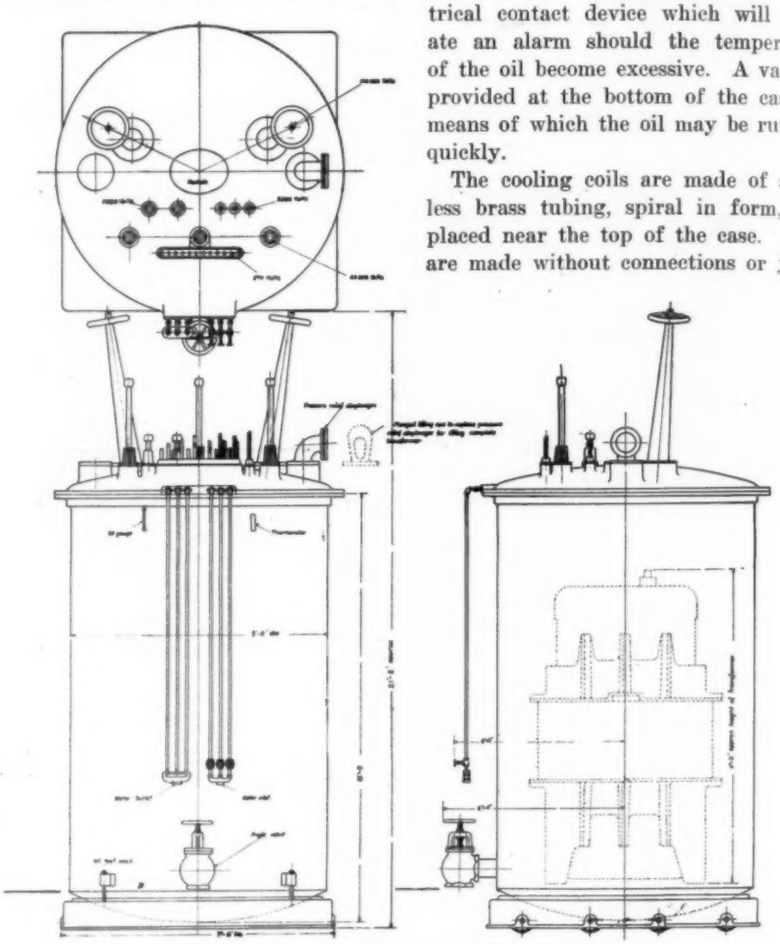


FIG. 6.—SECTIONAL VIEW OF WATER-COOLED TRANSFORMER.

superior grade of transformer sheet steel carefully annealed, and specially treated to prevent aging. Suitable bushings are provided in the case for high and low-tension leads, the high-tension bushings being of the condenser type described below.

The transformers are mounted in boiler-iron cases, all seams of which are welded. The case is mounted on a substantial cast-iron base, usually with wheels and provided with cast-iron cover through which the leads are brought. Suitable eye-bolts are provided so that the case, transformer and oil can be handled as a unit. The cover is provided with a relief valve to take care of any excessive pressure that may be generated inside the transformer. The case is provided with a gauge at the top to show the height of the oil, and pet cocks at the bottom for testing the condition of the oil. A thermometer placed near the top of the case with its bulb projecting into the oil indicates at all times the temperature of the surface oil. The thermometer is supplied with an electrical contact device which will operate an alarm should the temperature of the oil become excessive. A valve is provided at the bottom of the case by means of which the oil may be run out quickly.

The cooling coils are made of seamless brass tubing, spiral in form, and placed near the top of the case. They are made without connections or joints throughout the portion inside the case, and after forming, they are tested with a hydraulic pressure of 250 pounds per square inch.

The temperature rise at full load of any part of these transformers above the temperature of the entering water will not exceed forty degrees centigrade, the temperature being determined by thermometer and resistance methods. These transformers, when completed, stand an insulation test of double line voltage from high tension to low tension and to iron core for one minute.

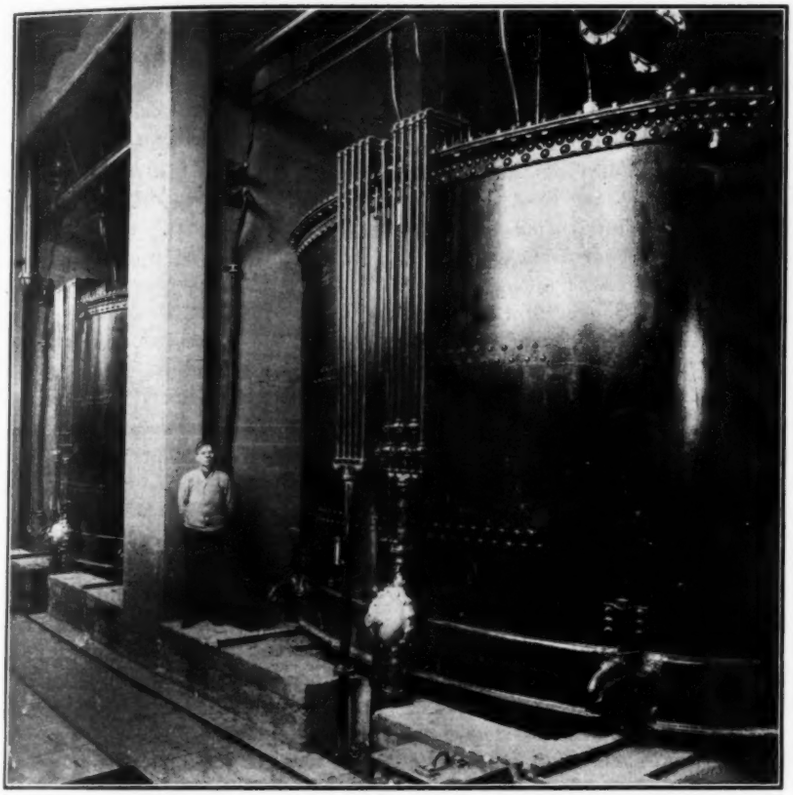


FIG. 7.—10,000-KILOWATT, WATER-COOLED, THREE-PHASE TRANSFORMER.

CONDENSER-TYPE TERMINALS.

For voltages of 100,000 and above, the necessary insulation for transformers, switchgear, etc., can only be obtained by the use of oil in the transformers and switching devices and the use of oil in large quantities such as is necessary for this class of apparatus practically necessitates strong metal tanks, usually of steel, to contain the oil and to resist the pressure developed by arcs. It is, of course, necessary to take current at 100,000 volts or more into these tanks normally through a metallic cover, and this has led to the development of terminals suitable for this very severe service.

It is self evident that such terminals must have sufficient mechanical strength to withstand successfully any pressure developed in the tanks by vapor, explosion, etc., and should be of such a design as not to require the cutting out of openings in the metallic covers of such sizes as to weaken these covers, and electrically these terminals must have sufficient strength so that any breakdown in the high-tension system will occur elsewhere than at the terminals.

The various transformers and circuit-breakers illustrated and described in this paper are provided with so-called "condenser-type" terminals.[2] Fig. 5 shows one of these terminals designed for use with a 300,000-volt testing transformer. The rod or tube forming the conductor is surrounded by a number of concentric condensers of predetermined capacity, arranged in such a manner that they are in effect connected in series so that the fall of static potential from the inner one, forming the line conductor, to the outer one, which is grounded, is such as not to strain the insulating material beyond its dielectric strength.

It may be noted that the rod or tube is surrounded by a layer of insulating material which in turn is covered by a thin layer of tinfoil, the alternate layers of insulating material and tinfoil forming condensers. The ends of the terminal are tapered off in steps, one step at the end of each layer of tinfoil. This arrangement of metallic cylinders fixes the potential difference between them and keeps it within the puncture strength of the insulation. As the edges of the metallic layer extend to the edges of the cylinder of insulation immediately surrounding it, the difference of potential along this surface is definitely fixed and can be kept less than the puncture strength of the surrounding medium, air or oil.

These terminals are made by winding paper under heavy pressure and at a high temperature around the metallic rod or tube that forms the conductor.

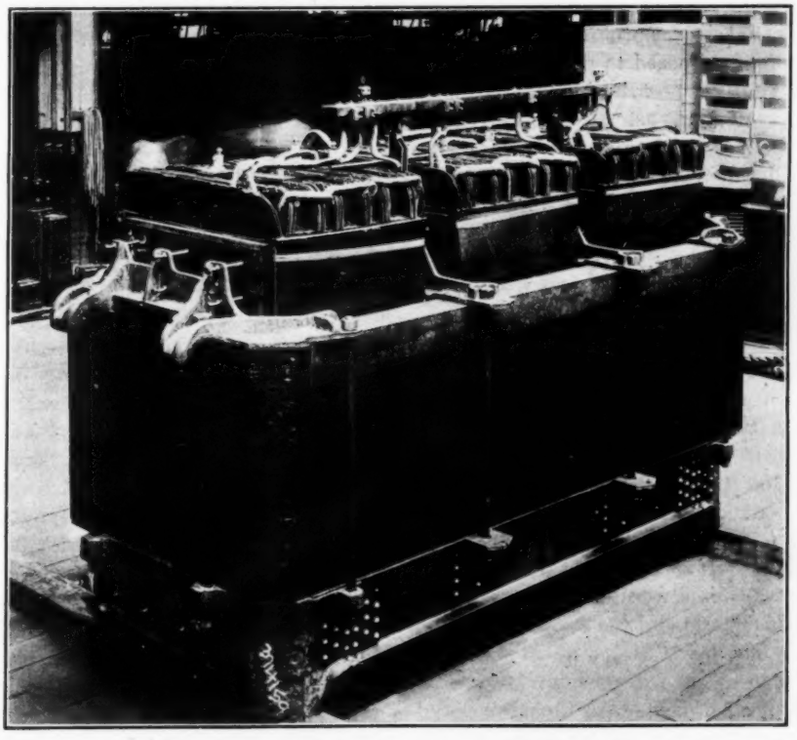


FIG. 8.—COILS AND CORE OF 10,000-KILOWATT, THREE-PHASE TRANSFORMER.

2 Described by A. B. Reynders, *Transactions* of American Institute of Electrical Engineers, 28, p. 209; 1909.

The various layers are bonded by a resinous gum and the temperature is so high that the gum is melted making a perfect bond between adjacent layers so that the tube when completed is virtually one solid mass.

Due to the leakage capacity to ground it has been found advisable to increase the capacity of the condenser at the line ends by placing a large metallic shield on the end of the conductor as shown. Another disturbing element found in actual service arises from the corona that tends to form, due to the sharp edges of tinfoil, but this is taken care of by the addition of metallic rings, electrically connected to the ends of the layers of tinfoil and the use of shields or balls at the ends of the inside conductor.

As shown in Fig. 2, this condenser-type terminal is adapted for outdoor service by covering the portion of the terminal projecting into the air by porcelain and filling in the space between the tube and the porcelain with a solid insulating material.

(To be continued.)

Wireless Arrangement at Liverpool.

Arrangements have been made by which it will be possible for a ship in the River Mersey to communicate with vessels in dock at Liverpool, England. Hitherto this was prohibited, as all messages are supposed to pass through the hands of the postal telegraph authorities. The Postmaster General of Great Britain has now made the concession that direct communication may be made from ships in the river to ships in dock although messages may only be sent by officers and must pertain exclusively to business in connection with the ship.

Franchise Values Reduced.

A reduction of $1,311,869 in the valuation of the special franchises of the Manhattan Railway Company, New York, in Manhattan and a slight reduction on the assessments of the company's special franchises in the Bronx Borough has been ordered by a decision of the Court of Appeals. The Manhattan franchises were originally assessed at $75,000,000 and the Bronx franchises at $3,500,000.

Exports of copper for the week ended October 19 were 6,010 tons. The amount exported since October 1 was 11,663 tons, as compared with 15,672 tons for the same period last year.

International Electrical Congress at Turin, Italy.

The International Congress of Applied Electricity which was held at Turin, Italy, from September 10 to 16, numbered among its members many of the men most prominent in electrical work and research from all nations. Many subjects of international scientific moment were discussed and numerous valuable contributions made to practical electrical science.

The first session was opened by S. E. T. Calissano, Minister of Posts and Telegraph. Nearly 500 members were present, among whom were J. W. Lieb, Jr., A. E. Kennelly, president of the United States National Committee of the Congress, T. C. Martin, S. W. Stratton, director of the Bureau of Standards, H. G. Stott, and C. O. Mailloux, representing the American Electrochemical Society.

At the first meeting, S. E. Boselli gave to the members the Government inaugural address, recalling the traditions created by the school of Galileo Ferraris. He spoke of the great progress of the industry and of electric transmission in Italy. That country, poor in coal but rich in water power, can and should hope to occupy one of the highest places among the other nations. He invited the members to visit the important installations in Italy, illustrated in the volume published by the Italian Electrical Publicity Association, which would be offered to those present. He further presented a volume of statistics of electric installations which was given to all members of the Congress, which publication showed the enormous progress which had been made in Italy in the last ten years. After the nomination of the president of the Congress and the acting vice-president, the following persons were made honorary vice-presidents: Antonio Pacinotti, Italy; Silvanus Thompson, England; Gano Dunn, United States; Paul Janet, France; Karl Strecker, Germany; Alfred Graf, Austro-Hungary; Pierre Osactchy, Russia; Gustave l'Hoest, Belgium; Hans Behn-Eschenburg, Switzerland; Luis de la Pena, Spain; V. Poulsen, Denmark. Presidents of sections were elected as follows: Section 1, generating machinery and transformers, Boucherot, France; Section 2, installations, central stations, switchboards, conduits, De Bast, Belgium; Section 3, instruments and methods of measurement, Kennelly, United States; Section 4, illumination and electric heating, Rossander, Sweden; Section 5, electric traction, Mailloux, United States; Section 6 telegraphy and telephony, O'Meara, England; Section 7, storage batteries, electrochemistry, electrometallurgy, Beckmann, Germany; Section 8, rates, taxation and legislation, Arno, Italy.

SESSIONS OF SEPTEMBER 11.

Opening the session of the first section, H. Behn-Eschenburg read a paper on "Electrical and Mechanical Characteristics of Modern and Special Generators with a Special Reference to Those of Very High Velocity." A discussion of this was taken up by Messrs. Sarli, C. Feldmann, Brunswick, and S. P. Thompson.

S. P. Thompson then read a paper on the subject "Converters, Rectifiers and Motor-Generators," which received much attention and brought out a number of valuable observations concerning the different types of machines.

In the absence of Dr. Hallo, his paper on "The Series Transformer" was read by Dr. Feldmann. Messrs. Brunswick, Sarli and Eichel took part in the discussion.

In the second section, Philip Torchio read a report on the "Choice of Voltage and the Construction of Substantial Switchboards in Large Installations," comparing the economy of installation on one side and continuity of service on the other. Jean Landry read a report on high-tension underground cables connected to aerial lines.

A. E. Kennelly, who presided over the third section, first called on Messrs. Barbagelata and Emanueli for their paper on "Methods of Opposition with Alternating Currents." Milo, Armagnat, Kennelly and Heinrich took part in the discussion. At this session Professor Dina also explained his study on the measurement of insulation resistance. No discussion of this subject followed and Professor Arno spoke of his electrodynamic induction meters.

In section four, Mr. Rossander gave his report on the present and future development of electric lighting, bringing out a number of very important points. Mr. Swingedauw, in discussion, described some heating devices, laying special stress on their hygienic qualities. The section was closed by Mr. Blondin's paper on "Cloth, Carpets and Clothes Heated by Electricity."

At the telegraphy section, over which W. A. J. O'Meara presided, a report was read on long-distance telephony. Other reports were read by D. I. Piro, and President O'Meara, the report of the latter dealing with the different systems of multiple telephony.

SESSIONS OF SEPTEMBER 12.

The problem of transformation of frequency was taken up in the first section by Paul Bunet. Mr. Boucherot, who presided, read a report on electromagnetic phenomena which result when a short-circuit is suddenly put on an alternator. Following this important paper, Messrs. Feldmann, Brunswick, Thompson and Sarli joined in the discussion.

At the second section, the discussion of M. J. Grosselin's paper on "High-Tension Underground Cables," which was interrupted the preceding day, was continued, Messrs. Delon, Gavaert, Lichtenstein, Jona and others taking part. The discussion concerned the limits of voltage on cables and the relation of the working voltage of alternating current to that of direct current. No conclusion was reached.

Other papers read were by M. Ragoen on the "Construction and Use of Automatic Circuit-Breakers," by Guido Semenza on the "Simultaneous Growth of Several Stations Which Feed a Network of Lines," and by Osuke Asano on the "Development of Electric Installations in Japan." Mr. Semenza's paper was discussed by Philip Torchio, who recommended in this respect several American installations, and by Dr. Wyssling, who mentioned several similar Swiss systems.

Mr. Arno at the third section resumed his discussion of the importance of an instrument which gives volt-amperes direct. As no discussion took place Mr. Revessi read a paper entitled "Stray Currents." Many interesting points were brought out in A. E. Kennelly's paper on "The Rotating Electric Current Field," for which the president thanked him, remarking at the same time on the importance of the method developed.

In the absence of Mr. Karapetoff, vice-president Dina read a report on some practical applications of electrostatic fields. The session was closed by Mr. Farney's paper on "A New Oscillographic Process with the Aid of a Braun Tube." A short discussion followed.

Mr. Calzolari opened the fifth section with his paper on "Monophase and Three-Phase Traction on Heavy Traffic Lines," giving in this a comprehensive résumé of his work. Messrs. Eichel, Beckmann Mailloux and others joined in the discussion which was continued on the following day.

In the absence of Mr. Poulsen, the secretary of the sixth section presented his paper on "Wireless Telephony." President O'Meara made some general observations stating that wireless telegraphy demands a special experimental staff and he believed that wireless telephony would in the future be more largely employed than wireless telegraphy. Mr. Milon was of the same mind as the president, and believed moreover that it would be possible to unite ships and small island stations with wireless telephony. This was followed by a consideration of Mr. Milon's paper on "Automatic and Semi-Automatic Telephone Systems Compared as to the Economy and Perfection of Telephone Communication in Large Cities," to which the president made several observations of a general order. He foresaw, he said, that in America in a little time the present systems would be supplanted by automatic and semi-automatic systems. Explanations of a technical character were then given by the author, by Mr. MacGrath and others.

The legal section was opened by E. C. Ericson, who spoke on legislation regarding the transmission of electrical energy. This was followed by a discussion by E. Gerard and others. The Dutch laws relative to the transmission of electrical energy were considered by Barnett Lyon.

SESSIONS OF SEPTEMBER 13.

On the opening of the second section, the presiding officer read a paper by Mr. Dumoulin on "Parallel Operation of Alternating-Current Plants." Owing to the extremely mathematical character of the work, discussion of it was postponed until further time. Mr. Boucherot, however, stated that the problem of connection of a number of plants was no more than a variation of the problem of connecting two machines of the same plant in parallel. It is necessary in the first case only to take account of constants, of connecting lines and of the situation of loads.

The third section was opened by a report by Clayton H. Sharp, on the electric meter, with reference to the different methods of charge. Mr. Torchio in opening the discussion confirmed the importance of the correctness of meters, giving at the same time statistics and figures from the Edison companies. A paper on the same subject was read by Mr. Laporte.

At the request of the president of the fourth section, Mr. Swingedauw gave an exhibition of his heating apparatus which he described at the session on September 11. The apparatus put in operation developed after a few minutes a remarkable current of hot air, consuming about nine kilowatts. The paper of Professor Monasch on the "Manufacture and Performance of Metallic-Filament Incandescent Lamps" was then read. He gave figures on tests which he had carried out which showed primarily a shorter life with alternating current, especially when the wave is not a sinusoidal one. To this Dr. Recklinghausen added that he had recently made trials on the use of tungsten as an electrode for arc lamps in an inert atmosphere, which he stated were extremely interesting. He asked at the same time if any other experimenters had made similar tests.

Mr. Hess, speaking on practical results with high-tension intensive arcs (6300 volts), gave a résumé on the conditions which these lamps should fulfil. He stated that as compared with the ordinary 220-volt lamps there was a saving of about $12.00 per lamp. Mr. Rossander asked if inductive resistances would be necessary, to which Mr. Hess responded in the negative. He stated that the lamps gave satisfactory performance with variations of from 5900 to 6800 volts. The discussion was deferred until the next meeting of the section.

Section five was occupied with papers on "Feeders for Electric Railways," and "Construction of Trucks for Single-Phase Operation," by Messrs. l'Hoest and Kummer. The discussion was taken part in by Messrs. Eichel, Mailloux, Palestrini, and others. C. O. Mailloux spoke on the choice of a practical unit of acceleration in electric traction.

Remo Catani opened the seventh section with a paper on "The Production of Steel Direct from Ore by Means of the Electric Furnace," Messrs. Ragno and Tofani taking part in the discussion. A paper by Dr. Guggenheim on "Electrical Problems in the Principal

Induction Furnaces Employed in Metallurgy."

Mr. Sartori, in the eighth section, presented a report which dealt with the problem of filling out the load curve of central stations. Following this Mr. Bonghi read a report on "A Comparative Study of Direct and Indirect Taxation of Electrical Properties in Different Countries." Am important discussion followed.

SUPPLEMENTARY MEETING.

At the supplementary meeting on September 13, President Lombardi presented the question of the organization of future electrotechnical congresses. Speaking of the history of the subject, he recalled that at Marseilles when the convention was held in that city in 1908, the idea was to organize an international commission whose duty would be to take charge of the affairs of the electrotechnical congresses. However the provisional commission which was named never arrived at any conclusion. When the Brussels Exposition took place in 1910, there was also an official reunion of the International Electrotechnical Commission, and this commission took upon itself the organization of the congress. As a matter of fact, the present congress utilized in its work the local committees of this same commission.

The president said that he thought the subject should be reconsidered. A motion was made by Mr. Feldmann, who thought that the International Electrotechnical Commission should exercise the function of directing the itnernational congresses. The motion made by Mr. Feldmann was to the effect that inasmuch as the provisory commission named by the congress at Marseilles had not come to any decision with a view of forming a permanent organization, this should be taken in hand. The International Electrotechnical Commission which was organized in 1906, was by its organization and its purposes meant to be a permanent body to bring about a closer union between the international electrotechnical congresses. Messrs. Thompson, Mailloux, l'Hoest, Strecker, and de Chatelain, each spoke in the name of the country which he represented.

The Congress decided to ask the Commission to accept responsibility for the organization of future electrotechnical congresses, both as to time and place at which they would be held, and as to their object, the details of the organization of each congress being confided to a national electrotechnical committee in the country in which the congress was to be held, with the assistance of the technical societies of that country.

Closing the meeting, the president gave out the details of the ceremony which was to be held by the French, the Americans and the Germans in connection with decorating the monument of Galileo Ferraris. In the afternoon the ceremony of honoring Ferraris's memory was undertaken by the Mayor of Turin and other authorities, who put at the feet of the statue three crowns. One of these in bronze was given by French members, another in bronze by the members from the United States, and the third a wreath of laurel by the city of Frankfort on the Main. Addresses were given by Ferdinand Meyer in the name of the French societies and by Philip Torchio in the name of the societies of the United States.

SESSIONS OF SEPTEMBER 15.

The first section was opened by Mr. Legouez, who read a paper on "Slip-ring Motors." This was followed by a contribution of Mr. Sarli on "Three-Phase Slip-ring Motors." Messrs. Palestrino and Finzi took part in the discussion. The final paper was given by Mr. Clerici on the "Cooling of Large Transformers." This was one of the most interesting of the papers and told of a series of tests which were carried on with air-cooled and oil-cooled transformers. The question of comparative temperatures in the oil and iron of transformers was discussed.

Professor Kennelly, who presided over the third section, opened by calling on Mr. Faccioli for a résumé of papers by C. P. Steinmetz on "The Nature of Transient Electrical Phenomena" and by E. E. F. Creighton on "The Protection of Electric Systems." This was followed by a report on the progress of the study of surges and methods of prevention and protection. A paper on this same subject was read by Professor Dina.

An interesting feature of the afternoon session was a paper by Professor De Chetelain on the "Laboratory of the Polytechnic Institute of Peter the Great at St. Petersburg for the Study of Very-High-Tension Circuits (500,000 Volts)." M. Neuhaus read a paper on "Safety Relays." Professor Grassi made a motion at this session cangratulating the American Institute of Electrical Engineers on its custom of always giving in its publications the equivalent in the metric system of values expressed in the English units. This motion was unanimously carried.

At the meeting of section four Leon Gaster spoke on "The International Outlook in Scientific Illumination." He dwelt on the necessity of studying the problems of illumination in every country, a thing which is not done at present, because there are several commissions who do not reach the desired goal on account of occupying themselves especially with photometry or some particular system of illumination, gas or electricity. He mentioned especially the work done by the Illuminating Engineering Society in England. He then demonstrated to the section an apparatus which measured illumination in a very simple, but nevertheless accurate, manner. C. H. Sharp exhibited a photometer for the measurement of illumination with high precision.

A motion was made by Mr. Gaster that the section propose to the Congress that an international commission be named for the study of all systems of illumination and all technical questions which are of interest from an illuminating standpoint; and that the Illuminating Engineering Society of London be requested to form this commission. He also suggested that there should be some co-operation with the existing photometric commissions. This motion was unanimously carried.

In a paper on "Parabolic Mirrors for Electric Projections," Mr. Pasqualini demonstrated that it is erroneous to believe that a parabolic mirror for projectors will be sufficiently exact so that all the rays will be parallel after reflection in the lamp. He mentioned a method of his own which was described in *La Revue Maritime* for the testing of mirrors and he described a more rational method for testing reflectors than the empirical one ordinarily followed.

Dr. Sharp read a communication from E. B. Rosa calling attention to the fact that the international candle had been adopted and was the unit ordinarily used in France, England and America. It has also been proposed that a second international unit of luminous intensity, the International Hefner, should be adopted, but he insisted that international agreement was necessary upon a single unit.

Section five was opened with a report read by Barnet Lyon for the committee appointed at the previous session on the choice of a practical unit of acceleration of trains. Following this a communication of A. Bezzi on "The Applications of Electricity in Submarine Boats" was presented by Mr. Brunswick. Mr. Gyaros read a paper on "Direct-Current, High-Tension Electric Traction" and C. O. Mailloux presented one on "Electrification of Steam Railroads." The latter paper was thoroughly discussed.

Section six was opened by Mr. Pedersen's paper on "Secrecy in Wireless Communications," the importance of which both in times of war and peace was further commented on by the presiding officer. After a brief discussion in which Mr. Bellini and Mr. Artom took part, Erskine Murray's paper on "A Definition of the Efficiency of Wireless Telegraph Systems" was presented. The meeting was closed by Mr. Bellini who explained the "Hertzian Azimuth Compass."

Section seven listened to a paper on "The Sterilization of Water by Electric Methods," by Dr. Erlwein. He dealt with the direct method of Webfler and Hermdle and the core method of Kellner, passing on to a minute description of the systems of ozonization and sterilization by ultra-violet rays. He made a comparison of systems especially with respect to the economy of operation and the time of treating different quantities of water, illustrating his remarks with very valuable lantern slides. The aqueduct which was built by the city of Rovigo and which uses the Siemens-DeFrise system of ozonization was mentioned by Mr. D'Andreis in the discussion. Mr. Recklinghausen brought up important points on sterilization by means of ultra-violet rays, reviewing some of the systems for the production of rays and giving their action on the life of microbes, the length of time necessary to be certain of their destruction, etc. He concluded with a description of the apparatus used in the physiological laboratory of the Sorbonne for sterilization of water in cities. In this apparatus ultra-violet rays are produced by a Westinghouse Cooper-Hewitt quartz lamp, the water passing several times in the active field of this lamp.

A question was asked by Mr. DeAndrais as to whether the action on the bacteria might not be due to the formation of ozone. Replying, both Mr. Recklinghausen and Mr. Erlwein remarked that his experiences showed that water which goes out of the sterilizers, that is to say, from the ultra-violet rays, does not present any trace of ozone.

"The Distribution of Electrical Energy in Farming Districts" was the subject of a paper by Mr. Lecler, this being the last of the session.

Mr. Ponti opened section eight with his report on "Rational Methods for the Commercial Measurement of Electrical Energy," which was followed by a communication of Professor Arno taking up the question of the purchase and sale of electrical energy.

SESSIONS OF SEPTEMBER 16.

At the closing session on September 16, the work of the various sections was summarized by the presiding officers. The Congress unanimously adopted the vote passed by Section III endorsing the action of the American Institute of Electrical Engineers in stating in its publications, equivalents in the metric system, of all values stated in English measure. A recommendation was made that the technical societies of all countries where the metric system is not official should adopt the same practice. The motion passed by Section IV was modified to read that the Congress believed it desirable that an international commission should be named for the study of all systems of illumination and of all technical problems dealing with illumination, and approved the proposal of the Illuminating Engineering Society of London to appoint such a commission, to work in conjunction with all other national commissions.

The question of acceleration of trains was then taken up. It was decided by the Congress that acceleration of trains should be expressed in kilometers per hour per second.

In the matter of electrical legislation, it was voted that codes regarding legal and technical provisions should be entirely separate, the latter to be subject to revision and interpretation by a permanent electrical commission in each country. Resolutions were also passed to the effect that there should be no tax upon the generation of the power except for lighting or in the case of private plants and that legislation should not be of such a nature as to give any other system of illumination any advantage over electricity; that any such tax should be general and not local; that financial statistics be collected for these industries, and published in easily accessible form.

A number of members signed a request that at the next International Congress there should be an "Educational Section." Mr. Mailloux, who was strongly in favor of such a movement, stated that all questions regarding electrotechnical education would be taken up by the section. He alluded to the fact that many countries lack societies such as exist in the United States whose purpose is the furtherance of education.

In an address which preceded the closing of the Congress, President Lombardi thanked the International Electrotechnical Commission which had accepted the proposition to call future congresses and thanked the American Institute of Electrical Engineers which had extended an invitation to the next congress to meet at San Francisco in 1915. He also thanked the various officials who had contributed to the success of the Congress. When he had finished, C. O. Mailloux, delegate from the United States, offered a vote of thanks to President Lombardi for his work and the manner in which he had conducted the meetings. He also said that instead of the congresses being too frequent, a statement often advanced, they were too infrequent, for progress was so rapid that great advances had been made since the last Congress. If these meetings had no other object than to keep engineers of different countries abreast of each other immense good would result. He extended an invitation not only to all electricians but to all Italians to be present at the San Francisco Congress.

Following Mr. Mailloux's remarks the delegates from different countries thanked the Congress on behalf of their Governments for the excellent work that had been carried on by that body.

In his closing remarks the president reviewed the work that had been carried out, making special reference to the numerous valuable papers and at the same time congratulating the members for the spirited discussion which took place. The hearty spirit of co-operation he especially commended. One of the most important things, he said, is the resolution adopted for the organization of future congresses by the International Electrotechnical Commission.

Other papers communicated by Amer-

icans not in attendance at the Congress, and not mentioned above, were "The Practical Calculation of Electrostatic Fields," by Vladimir Karapetoff; "Commercial Electrical Apparatus for 100,000-Volt Service," by Stephen Q. Hayes. C. O. Mailloux presented a paper on "Methods of Determining the Value of a Constant Current Having the Same Heating Effect as a Variable Current."

INTERNATIONAL ELECTROTECHNICAL COMMISSION.

The International Electrotechnical Commission held a series of meetings in Turin during the Congress, the first session being on September 7. R. E. Crompton, of England, honorary secretary, called the meeting to order, and Elihu Thomson presided. A second plenary session and two unofficial sessions were held, and in addition the council met to consider matters of finance and organization.

Nineteen countries were represented by fifty-two delegates. Col. Crompton was re-elected as honorary secretary, and Emil Budde, of Germany, was elected president. The delegates from United States were C. O. Mailloux, A. E. Kennelly, Elihu Thomson, Gano Dunn and Clayton H. Sharp.

Action was taken by the Commission upon a number of subjects which were brought before it, some of which had already been provisionally considered at the meeting in Brussels in 1910. The following provisions were adopted:

Instantaneous values of electrical quantities which vary with the time are to be represented by small letters.

Virtual or constant values of electrical quantities to be represented by capital letters. Maximum values of periodic electrical quantities to be represented by capital letters, followed by the subscrip *m*.

Magnetic quantities, constant or variable, to be represented either by capital script, gothic, heavy-faced or any special type.

Maximum values of magnetic quantities to be represented either by capital script, gothic, heavy-faced or any special type, followed by the subscript *m*.

The following quantities to be represented by the following letters:

Current	*I*
Electromotive force	*E*
Resistance	*R*
Electric quantity	*Q*
Inductance (coefficient of self-induction)	*L*
Magnetic force	**H**
Magnetic flux-density	**B**
Length	*L*
Mass	*M*
Time	*T*

The term "reactive power" was adopted for the quantity $E\ I\ \sin\ \Phi$ in alternating-current circuits where Φ is the difference of phase.

In the graphical representation of alternating electric and magnetic quantities, advance in phase shall be represented in the counter-clockwise direction.

The rating of electrical machinery received considerable attention and three recommendations which had already been considered at Brussels were adopted. These are as follows: (1) The output of generators is defined as the electrical power available at the terminals. (2) The output of electrical motors is defined as the mechanical power available at the shaft. (3) Both the electrical and mechanical powers are to be expressed in international watts.

A committee consisting of one member each from Belgium, France, Germany, Great Britain, Italy, Sweden, Switzerland and the United States is to continue the study of the rating of electrical machinery and apparatus. The proposition of the International Electrical Congress that the Commission should undertake the organization of future congresses was accepted and it was decided to accept the invitation of the American Institute of Electrical Engineers to hold an international electrical congress in San Francisco in 1915.

It was decided to hold meetings of the International Electrotechnical Commission in Berlin in 1913, and in San Francisco in 1915.

Three-Cent Rate in Detroit.

According to an agreement recently entered into by the Detroit United Railways and the Detroit city officials, tickets sold at the rate of eight for twenty-five cents will be good between the hours of 5 a. m. and 8 p. m. Tickets good during the remaining time will be sold at six for twenty-five cents.

Under the agreement all suits will be discontinued. The company agrees to build at least ten miles of extension each year and to sell the system to the city upon six months' notice.

Waterpower Development at Keokuk, Iowa.

At a meeting of the Hydraulic, Sanitary and Municipal Section of the Western Society of Engineers, held in Chicago, October 18, H. L. Cooper spoke on "The Waterpower Development of the Mississippi River at Keokuk, Iowa" and briefly reviewed the history of the water turbine. Much interest was added to his remarks by a number of excellent lantern slides.

The Keokuk development when complete will supply about 200,000 horsepower, this being generated by thirty units of 7,500 kilowatts each. An area of about 100 square miles will be covered by the water backed up, and the dam itself will be 9,096 feet in length.

A point of interest in connection with the building of the concrete arches of the dam is that these were cast in steel forms instead of the customary wooden ones. Nine of these forms are used, all parts being interchangeable, and this method has resulted not only in fast work, but in such accuracy that Mr. Cooper remarked that he defied any person to find a section of the dam that was a quarter of an inch out of line. Contracts have already been made for power which is to be sold to large consumers on completion of the project. The Union Electric Light & Power Company and the United Railways Company of St. Louis have contracted for 60,000 horsepower with a load-factor of sixty per cent. This contract is for a term of ninety-nine years and is on the rather unique basis that the price varies with the price of coal in the vicinity. Every ten years the power is to be revalued by arbitrators in accordance with the price of coal and if the arbitrators cannot agree on the current price of coal this is to be settled by the Federal Court. The total value of power to be supplied to St. Louis alone for the ninety-nine years was estimated by Mr. Cooper at about $150,000,000.

Concluding his remarks, Mr. Cooper extended a cordial invitation to the members of the Western Society to visit the Keokuk plant next spring when work is a little further advanced.

Northwest Convention.

The 1912 convention of the Northwest Electric Light and Power Association will be held in Portland, Ore.

NATIONAL ASSOCIATION OF RAILWAY COMMISSIONERS.

TWENTY-THIRD ANNUAL CONVENTION HELD AT WASHINGTON, D. C., OCTOBER 10.

The twenty-third annual convention of the National Association of Railway Commissioners was opened by a few brief remarks of welcome by the chairman of the Interstate Commerce Commission, Commissioner Clements, in which he reviewed the work accomplished by the Association, and its part in molding public opinion in favor of the regulation of public service utilities by commission.

"There are no new principles in this regulation of railroads; it is simply the application of laws as old as the country and based upon the still older English laws which never change; nor should those legislating ever be afraid to meet the exigencies of those changing conditions because of any cry of 'reactionary, insurgent, revolutionary,' etc., when it is merely new procedure to meet the required ends of justice and right by those who are required to meet these conditions as they may arise; and it is to meet these changing conditions that commissions have been formed, all for the purpose of meeting the spirit of progression which, from time to time, needs new laws, new regulations and new methods, and this applies not only to the railroads, but to water supplies and natural resources, and should we fail to meet these conditions there would be a failure to meet the requirements of future generations by those of the present generation upon whom these duties are placed. To fail to meet the conditions leads to conditions of monopoly and trust, and there is need for strong regulation with a due regard at all times to the private investment in these enterprises and properties that it shall not be confiscated or unduly oppressed; still there is the necessity to restrain charges so that they shall be reasonable, just, and indiscriminatory; so that they may be held within reasonable bounds and that justice may be done to all alike. The laws must be made to restrain those who do wrong and not those who are doing right. Where there is an eye single to the interests of the investor and the public these conferences cannot fail to be productive of great good."

Following the preliminary formalities came the speech of President Burr, in which, after calling attention at great length to the life struggle through which the railroad commissions have passed, the handling of household goods by freight, the express business, the growing importance of rail and equipment, and the general question of cost and accounting, recommended among other changes, that the Committee on Classification of Operating and Construction Expenses of Electric Railways be abolished and that hereafter its work should be combined with and performed by the Committee on "Accounts and Statistics of Electric Railways."

Among the many important reports was that of the Committee on Grade Crossings and Trespassing on Railroads, in which it was pointed out that when the trespasser realizes the railroad has property rights he must respect and the justice of the peace or other official realizes the public sentiment demands a fine or imprisonment in case of conviction, then the trespassing public will begin to take notice. The rapid increase in the construction and operation of interurban lines, the adoption of longer and heavier cars, and the increased speed at which they are operated in their attempt to successfully compete with the steam lines for other than local passenger traffic is operating as an added menace to human life at the grade crossings. From the fact that their operation is more frequent, attended with less noise, and the sound of their whistle is not so loud and strong, the pedestrian or the driver of a vehicle receives less notice of their approach, and thus the crossing at grade of electric lines is proving a greater source of danger, under ordinary conditions, than those of steam lines, and it is felt that the Association should give this matter special attention.

The Committee on Legislation presented its report.

The Committee on "Statistics and Accounts," of which Commissioner Meyer is chairman, called attention to the fact that, at the preceding convention a resolution of the executive committee was adopted, asking the Committee to give attention to the subject of the statistical reports made by telephone and telegraph companies. This matter was taken up by the Interstate Commerce Commission, which has in course of preparation a uniform system of accounts for telegraph and telephone companies, and it is hoped that this system will be in such shape that it can be promulgated on January 1, 1912. In the meantime it is proposed to obtain as a special report the statistics of these companies for the year ending December 31, 1911, based upon the accounts of the companies as they have been kept under the systems in use by the several companies. It is proposed to inquire from these companies at the close of the calendar year 1912 the first annual report upon the basis of the uniform classification of accounts.

Following a very important paper on capitalization by Martin S. Decker, of the New York delegation the report on Telephone and Telegraph Service was read by H. Warner Hill, of Georgia, now the second vice president of the Association.

TELEPHONE AND TELEGRAPH RATES AND SERVICE.

The report analyzes, to some extent, the nature of telephone and telegraph service, and indicates the seeming difficulty that exists in establishing a basis for classifying this service in effecting a fair system of rates. The service of the telephone is so different from that of the telegraph that they can not easily be compared. The fixing of rates, therefore, has to be upon a somewhat different basis for each. In determining a just and reasonable rate the commission should take into consideration the efficiency of the service as well as the amount of capital devoted to the public use. In October, 1910, the Georgia commission had occasion to investigate the jurisdiction of State commissions over telephone and telegraph companies. The following commissions reported that they had jurisdiction, but no specific telephone rules: Alabama, Florida (1911), Georgia, Nebraska, New York (second district), North Carolina, Oklahoma, South Carolina, South Dakota and Virginia. Vermont has jurisdiction, but no rules except requiring the filing of tariffs. Wisconsin has complete jurisdiction and has rules. The following commissions have no jurisdiction and consequently no rules regulating telephone and telegraph companies: Arizona, Arkansas, California, Connecticut, Colorado, Illinois, Indiana, Iowa, Kansas, Maine, Michigan (except as to approval of stock and bond issues), Minnesota, Missouri, Montana, Nevada, New Hampshire, North Dakota, Ohio, Oregon, Rhode Island, Tennessee, Texas (except to report dead-head service), Wyoming, except to act as board of equalization. The only commission heard from having jurisdiction and rules is Louisiana. The following commissions are investigating with a view to adopting rules and rates, viz.: Maryland, Massachusetts, Pennsylvania (as to rates and toll situation), Washington. No responses came for information from Idaho, Kentucky, Mississippi, West Virginia. New Jersey has power to prevent discrimination in rates, but other than this under the existing law its power with respect to rates is limited to making recommendations. A synopsis of the general rules of Louisiana may prove of interest. They provide that no telegraph company shall charge or collect more than twenty-five cents for any written message of ten words or less, exclusive of date, address, and signature, between any two points in the State, nor more than two cents for each additional word on any day message, nor more than one cent for each additional word on a night message; that messages must be forwarded promptly; that no telephone office where messages are received and trans-

mitted shall be discontinued or abolished without the consent of the commission; that there shall be no increase in the rates charged without the consent of the commission; that no telephone service shall be discontinued or instruments removed from the premises of a subscriber except for failure to pay authorized rates; that all long-distance toll rates shall commence from the long-distance toll board, regardless of the distance from the subscriber's telephone to the exchange that an additional charge of twenty-five cents per month over the regular charge for service with standard instruments will be permitted for nickel-plated desk telephones; that party lines will be installed and maintained at the exchange rate beyond one and one-half miles and within three miles from exchange; that telephone companies will be allowed to make contracts with new subscribers desiring service to keep the telephones for a period of twelve months from date of service, etc.; that the "exchange radius" shall be established at one and one-half miles from the telephone exchange, except in towns where the corporate limits are farther than one and one-half miles from the telephone exchange, etc.; that no company shall connect more than five subscribers on any country line; that all telephone companies shall print in all telephone directories a list of the public telephone stations on their lines, showing the rates to such station as are authorized; also a list of its toll stations, together with the toll rates to each station as authorized by the commission; that the list of stations and toll rates shall be revised and corrected at least once every three months. In view of the fact that but one State commission has adopted telephone rules, your committee recommends the advisability of the adoption of general telephone and telegraph rules by the State commissions as nearly uniform as circumstances and conditions will justify. Freight, passenger, and demurrage rules have been adopted by most, if not all, the commissions very similar in scope and purpose, and your committee is of the opinion that at least the same approximate uniformity should exist as to telegraph and telephone rules.

Mr. Stratsman, of North Dakota, stated that insofar as the report said the North Dakota Commission had no jurisdiction, it was incorrect, as at the last meeting of the Legislature in February, 1911, the telegraph and telephone companies were placed under the jurisdiction of that Commission, although no rules have, as yet, been promulgated by it.

Mr. Niles, of the New Hampshire Commission, also stated that the New Hampshire Public Service Commission has complete jurisdiction over telegraph and telephone companies in that State by virtue of an Act of the 1911 session of their Legislature.

Mr. Glasgow, of Michigan, stated that the Michigan Commission had complete control over the telephone companies, given them by the Act of the Legislature in August last, not only to cover their bonds and stock issues, but the telephone companies in that State cannot obtain a franchise for the purpose of organization and cannot commence the construction of telephone lines until they come before the Commission and get their certificate as to the reasonableness of such construction.

For Ohio, Mr. Gothlin, the incoming first vice-president, reported that taking effect July 1, 1911, the Public Service Commission of Ohio has jurisdiction over the telephone companies.

Mr. Watson, of the Oklahoma Commission, stated that in his State complete jurisdiction had been given the Commission over both telephone and telegraph service and rates, that the Commission has fixed its basis of rates on much the same basis as maintains in Mississippi. Since the delegation of power to the Commission they have been called upon by various cities and towns in that State to fix their rates, and in doing so they take a complete inventory of the property, and fix a rate that will give them a sufficient income on their investment. This has occasionally be appealed to the Supreme Court, but in every instance where it has been shown that the Commission fixed a rate that would give a reasonable return on the investment they have been sustained.

Mr. Hogueland, of Kansas, reported that the Act of May 22, 1911, confers upon the Public Utility Commission all the various duties that formerly belonged to the Railroad Commission, and in addition a supervision over telegraph and telephone lines, power companies and all other public utilities except those located within the cities. It is the opinion of the Commission that this is wrong, and that the control of all utilities, both those State wide and within the cities, should be vested in the State Commission. They also have control over the issuance of stocks and bonds.

Attention was called to the condition of utilities coming before the Commission, asking for increased issues of securities, when the existing indebtedness is such that the net earnings are not sufficient to pay the interest charges. In many cases money is needed for betterments, but it is apparent that it means only temporary relief and the ultimate addition of greater burdens. Where the traffic is constantly increasing the indebtedness of the corporation may be increased materially without hardship, but where traffic earnings cease to increase and fixed charges constantly mount up, the rate of return to stockholders must inevitably decrease.

Mr. Robertson, of South Dakota, called attention to the great number of independent telephone companies in that state which were now applying for the privilege of securing new capital and asking for an increase in the rates charged. These companies have proved unremunerative, the equipment is obsolete and unfit for service, and the new capital must be written against entirely new equipment.

The Association will meet at Washington, D. C., November 19, 1912.

National Gas and Gasoline Engine Trades Association.

At a meeting of the Executive Committee of the National Gas and Gasoline Engine Trades' Association it was decided that the date of the next annual meeting be December 5 to 8, with the Hotel Hollenden, Cleveland, O., as headquarters.

An exhibit of accessories will be an important feature of the convention. Accessory manufacturers at previous conventions having demanded that more opportunity be given for this part of the meetings, special attention has been paid to this exhibition in the convention program. Arrangements have been made for about 100 exhibitors and allotments of space will be in order of receipt of entries, so that those desiring to make exhibitions should communicate at once with the secretary, Albert Stritmatter, 224 East Seventh Avenue, Cincinnati, O. The forenoons of each of the four days will be given up to the exhibition, so that there will be ample time for careful inspection of this department of the convention.

The evenings of the various days will be allotted to the entertainment committee, the four afternoon sessions being provided with important papers and general discussions of matters of interest to the trade.

The object of the association is to advance the interests of all who are directly interested in gas or gasoline engines, and all such persons are eligible to membership. Annual dues are $5, initiation fee $5.

New York Electrical Society.

The 304th meeting of the New York Electrical Society was held in the Engineering Societies Building on October 27. A lecture was given by George O. Squier, Major, United States Signal Corps, on the subject "Electric Waves Directed by Wires for Intercommunication Purposes."

THE NEW STANLEY STORAGE RANGE.

AN IMPORTANT DEVELOPMENT IN THE APPLICATION OF ELECTRICAL ENERGY FOR HEATING AND COOKING.

Many attempts have been made to devise an efficient means for utilizing the heat obtained from electrically transmitted energy for domestic cooking purposes.

The principal difficulty encountered has been the necessarily high rate of charge for this character of electric service, for it is found in practice that an electrical cooking outfit of the types heretofore used requires approximately a peak demand of from four to five kilowatts per customer, while the total kilowatt-hours of daily service vary from five to twenty kilowatt-hours according to the particular style of living that the consumer enjoys. Such short-time, high-peak service cannot be purchased at a low rate.

EXPERIMENTAL MODEL, TWO-STOVE STORAGE RANGE.

Several years ago WilliamStanley, the experimenter and inventor, undertook a serious study of this problem and the heat-storage electric range described herewith is the result in part of this study. In attacking the problem of heat transformation for this purpose, Mr. Stanley has brought to his assistance a remarkable experience. He has always been doing things, and the fruits of his labor are in evidence in many practical developments of electrical apparatus that are in use today. In 1885 and 1886 Mr. Stanley developed the first transformer and generator, and devised the alternating-current system now in general use. In the winter of the same period he built and operated at Great Barrington, Mass., the first alternating-current plant in the country. In 1887 he built the first auto-transformer and invented the induction feed regulator. In 1889 the first induction alternator. In 1890 the first induction wattmeter. He has been constantly at work developing useful ideas and making practicable applications of them, and the latest effort of his genius bids fair to accomplish as great a commercial success as any of the other important productions of which note has just been made.

Mr. Stanley's invention brings the storage range within the possibilities of the ordinary customer of the central station. It reduces the station demand and therefore makes possible a low rate. It furnishes a very rapid cooking device which is always ready for the cooking operation at a low cost.

In ordinary cooking and heating operations the rate of delivery of electrical energy to the heating unit and after transformation into heat energy to the article to be heated or cooked, is large. Thus, to bring four quarts of water from tap temperature to a boil in six minutes requires about 3.5 kilowatts. These 3.5 kilowatts disappear in the water during the six minutes, or 0.350 kilowatt-hours are required to heat the water to the boiling point. Again, to fry half a dozen eggs in three minutes requires, to heat up the frying pan and supply the losses from it to the air, a flow from a hot stove to the frying pan of one to two kilowatts for three minutes. On the other hand to cook a five-pound roast of beef requires a flow of heat from the oven to the roast of approximately 0.3 kilowatts for an hour.

Mr. Stanley has perfected a heat-storage electric range that eliminates this large energy demand from the station. Energy is supplied continuously at a low rate and the heat is delivered at will at any rate which may be required for the heating or cooking operation. In this range about 500 watts are delivered continuously and converted into heat in masses of material called storage units having a high specific heat per unit of volume.

When the electrical energy is first supplied to the storage, the temperature of these storage units increases from hour to hour. There is a constant flow of heat to them and an increasing flow of heat from them due to their increasing temperature. These units are thermally insulated so as to prevent the loss and consequent waste of heat. In working out the thermal insulation many novel and interesting facts have been disclosed and thermal insulation values have been attained far beyond those hitherto commercially applied.

In the range under description the oven lining or shell consists of an iron box 12 inches high, 18 inches deep and 18 inches wide. The oven bottom is equipped with a cartridge-type heating unit receiving continuously 200 watts for conversion into heat. The box is surrounded on all sides by insulation. On the door side the oven lining is connected to the outside wall by a throat of high thermal re-

sistance material reducing the outward heat flow and loss from the hot interior. The oven walls form the storage mass. The insulation is so proportioned to the energy required that the maximum temperature attained by the storage is approximately 250 degrees centigrade. A spiraled calorite wire unit is placed in the top of the oven and is normally out of circuit. When it is desired to roast, for example, certain switches are manipulated transferring the energy from the storage masses to the spiraled unit in the oven top. In this way all the energy delivered to the range is concentrated upon the searing unit heating it quickly to a radiant temperature. The beef in the oven receives this radiant heat and is seared in a few minutes. As soon as the searing is completed the switches are again thrown and the energy is returned to the storage masses. In this way the extra heat of searing is obtained without calling for additional energy from the station. The roast remains in the oven for the cooking period, during which time the oven walls part with some of their stored energy by radiation and by convection, heating and roasting the beef satisfactorily. During this operation the oven loses part of its stored heat and the temperature falls a few degrees. As soon as the roast is removed the oven begins to recover, regaining its initial temperature.

In the top wall of the oven storage casting there is a round throat leading to the range top. This throat is supplied with an insulating cover. When this cover is removed the oven casting is exposed. This may be utilized for the heating of a vegetable cooker, the utensil receiving heat from the oven storage. In this manner three or four vegetables may be cooked while roasting or baking is going on inside the oven.

Special arrangements are provided to furnish the high temperatures required for many operations of cooking. The essential feature of this arrangement is a cartridge-type heating unit supplying heat to a storage mass buried in insulation into which iron plungers or pistons are placed. These plungers may be raised to the range surface or dropped back into the heated storage mass. About 0.3 kilowatt is continuously supplied to heat the storage mass. The heat thus supplied is conducted throughout the storage mass, heating it to a maximum temperature of 550 to 575 degrees centigrade, that is, to a barely visible red heat. When a certain cooking operation is required the cook gives a handle connected with the plunger a turn. A little elevator connected with the plumbing system of the house raises the plunger, automatically removing the range cover and exposing to the frying pan or other utensil its heated surface. The maximum yield or flow of heat from one of these plungers to a cooking receptacle is about 3.5 to four kilowatts. Few stove operations require more than one kilowatt flow of heat for a few minutes. The supply of the heat from the storage is therefore ample. The total energy supplied to the range for oven and stoves is approximately 500 watts.

The advantages of this range appear to be that it affords the supply station a valuable constant load; while it furnishes the user cheap heat for cooking porposes, it cooks faster than either the coal or gas range; it can be operated at a reasonable cost; it may be connected to any existing circuit without special transformers, wiring or meters; it is clean, neat and sanitary; it is of substantial construction and easy to operate; it is designed in unit parts and is capable of ready manufacture.

Where energy on this constant-demand plan can be sold for $120.00 per kilowatt-year this range would cost $60 a year or $5 per month to operate. A hotel or restaurant outfit with a ten-hole storage range with four large sized ovens can be maintained on less than three kilowatts.

An accessory apparatus to the storage range is the storage water heater consisting of an insulated kitchen boiler, into the top of which a cartridge-type heating unit is inserted. The water surrounding the heating unit is enclosed by a tube or pipe and when heated is delivered at the top of the boiler or tank. In this way layer after layer of hot water is gradually accumulated. When the water is drawn for use the hottest is taken first, the all-day efficiency of this heater being approximately eighty per cent. A thirty-gallon boiler heated by 300 watts will deliver approximately forty gallons at fifty degrees centigrade during the day and a forty-gallon heater heated by 400 watts approximately fifty gallons at fifty degrees centigrade per day. Of course heat is being supplied continuously and the efficieney is zero if no water is drawn. For a family of five people the storage range would consume 500 watts continuously and the water heater 300 to 500 watts continuously, making a total of 800 to 1000 watts. At one and one-half cents per kilowatt-hour this outfit will cost the consumer for 800 watts $105.00 per year or $8.75 per month. At two cents per kilowatt-hour it will cost the consumer $140.25 per year or $11.60 per month.

Importance of Proper Description of Merchandise Offered for Exportation.

Exporters, manufacturers preparing material for exportation and transportation companies carrying merchandise of this character will be interested in a circular just issued by the Bureau of Statistics, Department of Commerce and Labor. It calls the attention of persons forwarding merchandise from the interior for exportation at the seaboard or border ports to the importance of accompanying the same with a proper and detailed description. The official "Export manifest" supplied to the collector of customs by the export agent or other person at the port at which the merchandise leaves the country is necessarily the sole reliance of the collector of customs for the description which he forwards to the Bureau of Statistics, and upon which that Bureau must base the information which it gives to the public regarding the character of merchandise exported. The importance of a thorough understanding of this subject is illustrated by the following extracts from the laws and regulations:

Before a clearance shall be granted for any vessel bound to a foreign place the collector of customs shall require the owners, shippers, or consignors of the cargo to deliver to him manifests of the cargo or the parts thereof shipped by them, respectively, which manifests shall specify the kinds and qualities of articles shipped by them, respectively, the value of the total quantity of each kind * * * and the foreign country in which such cargo is truly intended to be landed. The manifests shall be verified by the oath of the person by whom they are respectively made and subscribed. The merchandise must be described in specific, not general, terms.

Central-Station Practice

USE OF PRODUCER GAS IN TEXAS.

BY W. D. HORNADAY.

Many of the electric light and power and waterworks plants in Texas are using producer gas. In an investigation of this subject just made by the Bureau of Economic Geology and Technology of the University of Texas, interesting facts in regard to the different plants were brought to light.

AMARILLO WATER, LIGHT AND POWER COMPANY.

The equipment consists of one Westinghouse producer rated at 440 horsepower at sea level, one Westinghouse 18-by-26-inch gas engine rated at 380 horsepower at sea level, direct-connected to a Westinghouse 250-kilowatt 2,300-volt generator. This equipment is now being duplicated.

The fuel is screened pea bituminous coal from Colorado, and costs $4 a ton. The following operating data is quoted from a letter from the company:

"Total coal, pounds, 192,487; hours of actual operation, 682; kilowatts generated, 88,250; average pounds of coal per kilowatt-hour, 2.19; average run per day, 22 hours."

This letter further states that the average load is 130 kilowatts and that the gas will average 125 British thermal units per cubic foot. The production of tar is a barrel in three months, this coming from the scrubbers and being full of lampblack. The water from the scrubbers goes to the sewer.

Producers were installed here to replace steam, and entire satisfaction is expressed with the operation, as is shown by plans which contemplate a plant of 1,000 kilowatts.

THE HOME LIGHT AND WATER COMPANY OF BLOOMING GROVE.

Equipment: one 60-horsepower Smith suction down-draft producer; one Rathbun-Jones two-cylinder vertical gas engine of 60 horsepower. The engine is direct-connected to a line shaft from which are driven an Allis-Chalmers generator, an Ingersoll-Rand two-cylinder air compressor for "blowing" a well from a depth of 200 feet, and a Fairbanks-Morse geared two-cylinder pump for lifting water from a surface tank 100 feet to a stand-pipe. The generator is an alternator of 17 kilowatts at 2,200 volts, and operates about 12 hours a day, from noon until midnight, at an average load of 35 per cent. The compressor requires about 25 horsepower, and operates about seven hours. The pump requires about 12 horsepower and operates about four hours. The average fuel consumption is about 1,600 pounds per 12 hours. The lignite used is from the mines of the Consumers' Lignite Company, Hoyt and Alba, Wood county, and costs $2.10 a ton, delivered.

The producer is of an old type; the fire-containing shell rests directly upon the foundation, the ashes being drawn by hand with long-handled shovels. The jacket water is further heated in an exhaust heater and goes to the saturator at a temperature of about 140 degrees Fahrenheit, which can be increased to 170 degrees.

This producer, in addition to the gasoline-engine-driven blower for starting, is further equipped with a hand blower so arranged as to be connected with the producer only when the main air inlet through the saturator is closed. It is used regularly to force gas to the engine for starting. The use of this hand blower does not seem to be required, as it was not observed elsewhere.

The plant has been in operation about three years, during which time the repair account has been very small. The pipes in the exhaust water heater are eaten up in eighteen months.

CANADIAN WATER, LIGHT AND POWER COMPANY.

The equipment here consists of two producers of 100 horsepower each and two gas engines of 100 horsepower each, of Westinghouse make. The fuel is bituminous coal from New Mexico. This plant was not visited and no further information could be secured by correspondence.

THE PEOPLE'S LIGHT COMPANY OF CORPUS CHRISTI.

The original plant here consisted of one Smith suction producer of 125-horsepower capacity, and on Rathbun Jones three-cylinder vertical gas engine. The engine was direct-connected to a Westinghouse two-phase generator at 2,300 volts. This equipment was afterwards increased by a No. 6 Wood suction producer, rated at 300 horsepower, and a Rathbun-Jones engine similar to the one in use, but rated at 300 horsepower. It was found that the producer would not supply sufficient gas for rated capacity, so a larger Wood, No. 7, was installed a few months ago by the manufacturer. Since that time there has been no trouble, the two Wood producers carrying the entire load, while the Smith producer is held in reserve.

The large engine carries the entire lighting and power load from 6 a. m. to midnight, the small engine being then used. Both generators deliver two-phase current at 2,300 volts, but no attempt is made to synchronize. The lighting current is transformed to 110 volts, with some power current at 220 volts, and the street-car current is converted through a rotary to 550 volts direct current.

The exhaust from the large engine is led through a heater for supplying water vapor to the saturator, which is arranged to serve both producers. The maximum temperature of the blast is 150 degrees Fahrenheit, which is not as high as has been found best at other plants where a similar arrangement is in use. It is questionable whether the exhaust from a 300-horsepower engine will furnish enough water vapor for two producers of this size, particularly when the heater is at least 25 feet from the engine. When the large engine is shut down, six hours out of every twenty-four, the blast is not heated at all, as the small engine exhausts direct into the air. It is during this time that clinkering is most apt to occur.

On full load the larger producer is charged with 200 pounds of lignite

every hour, the smaller one with a like amount every two hours, both being cleaned every morning. In general, the suction is proportioned to the size of the producers and the fuel consumed in each. Clinker troubles are frequent and serious, masses of such size and consistency as to require sledging on the end of a one-inch poker being of common occurrence. The repair bill for broken pokers is sometimes as much as $15 in a month. This trouble has not been observed elsewhere in so serious a form, and it seems likely that means for obviating it would more than repay the expense. Among other things, both the temperature and the wetness of the blast might be increased when a clinker is observed to be forming. All cooling, scrubbing and jacket water is drawn direct from the bay (salt water) by small motor-driven centrifugal pumps, and all waste water and tar runs into the bay. Several hundred pounds of tar are produced daily, but no accurate measurements have been taken, and there is no attempt made to utilize this product.

Salt water makes no appreciable difference in producer operations, although heavy incrustations were observed at one or two points where a slight leak had developed in the outlet piping from the engine jackets. It seems natural to suppose that in time such incrustation would be a source of trouble. It is understood that the original water-jacketed exhaust valves did give trouble on this account; at any rate, they have been replaced by air-cooled valves. Various lignites have been tried here, such as Calvert, Crockett and Rockdale. The price of the Calvert lignite, delivered at the works, is $2.65 a ton, of the Crockett lignite, $2.67, and of the Rockdale lignite, $2.47.

The operating labor consists of three firemen, two ashmen and two engineers. The firemen and ashmen are Mexicans, at $1.50 a day.

Owing to the recent installation of the larger producer, no definite method of operation has been developed, nor are there any definite figures as to the consumption of fuel per kilowatt-hour. Before the new producer was installed and while the one then in use was being forced beyond its point of economy, the fuel consumption was more than five pounds per kilowatt-hour. Of late, however, this has been reduced to a little over three pounds, and there is a probability of an additional reduction, especially if the combustible matter remaining in the ash is lessened by more frequent poking of the fuel bed and by drawing ashes oftener. Additional poke-holes and ash-doors have been made in the sides of the Wood producers, but as these were not observed elsewhere in similar installations their usefulness may be questioned.

GAINESVILLE ELECTRIC COMPANY.

Equipment: one 150-horsepower Smith suction down-draft producer. One Nash three-cylinder vertical gas engine rated at 150 horsepower, but developing 135 horsepower. The engine is direct-connected to a General Electric direct-current generator at 250 volts, 400 amperes, 250 revolutions per minute.

This unit operates 24 hours a day for about two weeks and is then out half a day, Sunday. It is not of sufficient capacity to handle the night load, and is helped, for about four hours, by the steam plant. Fires are kept banked under two boilers all the time, Arkansas slack coal being used, with a supply of oil for sudden demands.

The original plant here, as at many other places, was steam. Increasing demands caused the installation of the producer plant to use lignite two years ago. The producer plant was at first used merely as an auxiliary to the steam plant, but it soon showed such economy in fuel that the steam plant is now the auxiliary. The lignite used costs $1.95 per ton at the plant. On normal operations less than five pounds of lignite are used per kilowatt-hour.

The operating force consists of three men per 24 hours, two of these being on duty from noon until midnight and one from midnight until noon. These men were all employed in the old steam plant and had had no previous experience with producers.

The producer is charged every three hours, and the fire is rodded down at a like interval. The grate is equipped with the air-shaker now supplied with this producer, and is given two or three "licks" every hour. An individual motor drives the elevator for the ashes, and these are drawn at irregular intervals. Some large masses of clinker were noticed and the combustible matter left in the ashes was greater in amount than was observed at some other plants. The temperature of the blast was 140 degrees Fahrenheit, and the hot water was obtained both from an exhaust heater and the economizer. An increase of temperature of the blast to 160 degrees Fahrenheit can be readily attained. The scrubber is run by an individual motor. No attempt is made to save the tar or ammoniacal liquor.

A small gasoline engine drives the blower and compressor, and the compressor may also be driven from the engine shaft. The lignite is screened before going to the producer, with a considerable loss in fine stuff.

GATESVILLE POWER AND LIGHT COMPANY.

Equipment: one Smith suction down-draft producer, rated at 75 horsepower; one Muenzel single-cylinder single-acting horizontal gas engine, rated at 80 horsepower. The engine is belted to a General Electric alternator of 75 kilowatts at 2,300 volts, three-phase, sixty cycles.

The fuel is lignite and costs $2.27 a ton at the plant. The engine runs from 4 a. m. until midnight on about 2,000 pounds of fuel, with an average load, for the entire period, of 25 kilowatts, although this rises to 60 kilowatts for a few hours when a roller-mill uses the current. The original plant used steam, and was operated for several years. The engine was of 110 horsepower, but was never run on full load. The producer-gas plant was put in about twenty months ago, and has already shown a marked saving over the steam plant. The consumption of lignite under the boilers was more than twice the present consumption. The president of the operating company stated that the difference in the cost of the two plants would be written off in a little less than six years, under present conditions. Sliding rates for power and light are in effect, the prices ranging from 5 cents to 15 cents per kilowatt-hour. Three men do all the work at the plant and on the lines.

The producer is charged every six hours and ashes are drawn by hand once in 24 hours. At the time of the visit, a large pile of clinker was noticeable, some of the pieces being of considerable size. The ash also contained some combustible matter. No

attempt is made to save the tar or ammoniacal liquor. As in the case generally with this type of producer, the Smith, the tar is not only small in amount, but is very fine and of a yellow color.

There is a water heater in the exhaust line, but only a part of the jacket water is passed through it, as the passage of the entire quantity would so far reduce the temperature as to render it almost useless in the saturator. With the engine on half load the temperature of the water was 113 degrees Fahrenheit, the top of the producer being half open and the ash pit overflowing a little. On starting up about twenty minutes are required to get gas to the engine.

The scrubber is driven from the main shaft through a belt. The coal elevator, blower and compressor are driven by a gasoline engine.

HUNTSVILLE ELECTRIC LIGHT AND POWER COMPANY.

Equipment: one Fairbanks-Morse producer of 100 horsepower; one Fairbanks-Morse gas engine of 100 horsepower, belted to generator. The service is twenty-four hours, driving generator and ice machine of twelve tons capacity.

The fuel is lignite screenings and the consumption is 9,645 pounds per twenty-four hours. The cost of the fuel at the plant is 90 cents a ton.

The tar is mixed with lignite screenings and is burned under the boilers. No use is made of the ammoniacal liquor. Leaky valves and stopping-up of pipes, due to poor tar extraction, has given some trouble at this plant.

The original installation here was steam, but there is a considerable saving in fuel and labor since the introduction of the producer plant.

THE KINGSVILLE POWER COMPANY.

Equipment: one 100-horsepower Smith suction producer and one 100-horsepower Rathbun-Jones three-cylinder vertical gas engine. The producer is said to be of insufficient capacity to operate the engine at full load. The engine is belted to a Western Electric Company's alternator for supplying lighting current at night, being idle during the day.

No records were obtainable concerning fuel consumption or power delivered, but from 1,800 to 2,000 pounds of lignite are used every night. The exhaust from the engine is led through a water heater for supplying water vapor to the saturator. The temperature of the blast varies from 140 degrees to 170 degrees Fahrenheit.

The ash pit of this producer is generally kept full of water to within a few inches of the grate to "settle the ashes." No coal is charged during the day, but the producer is filled when the engine is shut down in the morning and the ashes thoroughly drawn and new coal charged when the blower is started in the evening. From the time of starting the blower twenty minutes are generally sufficient for securing good gas at the engine.

In order to obtain additional power for use in a new cotton-seed oil mill there has recently been installed a 350-horsepower De La Vergne twin oil engine for using crude oil. The guarantee of this engine is a brake horsepower from 0.6 pound of oil. This engine has not been operated on full load, but tests have shown an efficiency a little higher than the guarantee.

No attempt is made to recover the tar or ammoniacal liquor, nor is the tar burned under boilers in the ice plant belonging to the same company.

LEONARD ICE AND LIGHT COMPANY.

This plant has not been in operation for the past year. The equipment consisted of a 65-horsepower Fairbanks-Morse suction up-draft producer and a Fairbanks-Morse single-cylinder horizontal gas engine rated at 50 horsepower. The plant was in operation, but not continuously, for about two years. The fuel used was screened-lump lignite and cost $1.34 a ton, delivered.

The company changed hands and the producer power plant was turned over to the manufacturer. Since that time it has been dismantled and removed. The plant is now operated by steam, lignite being used under the boilers.

HOME LIGHT AND POWER COMPANY OF MART.

The equipment consists of one 100-horsepower Fairbanks-Morse suction up-draft producer and one two-cylinder vertical gas engine of the same make, rated at 100 horsepower. During the cotton-ginning season this plant operates steadily at full load, with a daily fuel consumption of about 4,400 pounds of lignite. It rarely operates except during the ginning season, but is held in reserve as an auxiliary to a steam-driven generator which is a part of an ice plant. The gas engine was the original installation but the addition of the ice plant made steam necessary, and it was not found economical to continue the gas-unit in continuous operation.

The lignite which is used in the producer and under the boiler costs $1.55 a ton delivered. About a barrel of tar a day is produced when the gas unit is in operation, and is used for tarring the butts and the cross-arms of poles used by the company. No attempt is made to save the ammoniacal liquor.

MINEOLA LIGHT AND ICE COMPANY.

Equipment: one Smith suction down-draft producer of 100 horsepower, one Rathbun-Jones three-cylinder vertical gas engine rated to develop 90 brake horsepower on 80 cubit feet of gas of 135 British thermal units per cubic foot, at 700-feet elevation. The engine drives a line shaft for two generators. The gas unit operates about 13 hours every night during the winter months and about 11 hours during the summer months. The winter load is greater than the summer load, and the consumption of fuel is correspodingly higher. Lignite screenings are used, 2,000 pounds a day in winter and 1,400 pounds in summer.

Two boilers, of 80 and 50 horsepower, are used for the ice machines and for driving a 25-kilowatt Curtis horizontal turbine for the day load. These boilers are rarely operated at rated capacity, the average load seldom being over 110 horsepower. The fuel used under the boilers is the same as is used in the producer, lignite screenings, yet the consumption is about four times as great.

In the original plant here, which was operated about seven years, there was an Ideal automatic engine. The producer plant has been in operation three years, and has shown a net saving of $500 a year. It represents an investment of about $13,000.

The lignite screenings used cost 90 cents a ton, delivered. Screened lump, which may be used, would cost $1.40, delivered. The producer is of an old type, the fire-containing body resting directly upon the foundation and the ashes falling into a pit from which they are drawn with long-handled shovels. The three charging holes in

the top of the producer are absent and the fuel is fed directly inside the ring at the top, instead of outside of it, as is the case with the newer type of this producer. Hot water is supplied from an exhaust heater situated on the side of the engine away from the producer. The producer is charged four times during its run, and the ashes are drawn every morning after the engine is shut down. The ashes were free of combustible matter, and no large clinkers were seen.

For the most part, the tar is thrown away, although a little has been used to dip some poles and cross-arms. No attempt is made to save the ammoniacal liquor.

ROCKPORT ICE AND LIGHT COWPANY.

Equipment: one 50-horsepower Fairbanks-Morse suction up-draft producer and a 50-horsepower Fairbanks-Morse gas engine, single-cylinder, horizontal. The engine is belted to a Fairbanks-Morse generator, rebuilt by John B. Connelly, San Antonio. The engine operates not more than ten hours a day on a fuel consumption of about 1,500 pounds. The generator has not hitherto been loaded to more than three-fourths of the rated capacity.

While operating, the producer is charged every one and one-half hours with about 200 pounds of lignite and immediately before charging the fire is poked down and the ashes drawn. The ash-pit is cleaned once a day. The cooling and scrubbing water is drawn from one of six wells drilled for the ice plant, and all waste products are discharged into the bay.

SMITHVILLE LIGHT AND POWER COMPANY.

Equipment: one 150-horsepower Fairbanks-Morse suction up-draft producer and one 150-horsepower Fairbanks-Morse three-cylinder vertical gas engine. The engine is belted to a line shaft which is connected, through a belt, with the generator. The fuel is lignite from the mines of the Independence Mining Company, Phelan, Bastrop County.

The engine operates practically all the time, for it performs three classes of service. The pumps for supplying the town of Smithville with water are in constant use. During the day the power necessary for operating an aerial tram system for conveying sand and gravel from the bed of the Colorado River is taken from the main line shaft through a rope drive. At night the lighting load approaches the rated capacity of the engine. The fuel used is approximately 4,000 pounds per twenty-four hours, the producer being charged about every three hours on day load and about every two hours at night. There was trouble, at first, in discharging the tar through the waste-pipe, but this was corrected by piping the hot water from the engine jacket to the scrubber. No attempt is made to save the tar or ammoniacal liquor.

Two features of this plant deserve special mention. First, the use of cotton-seed hulls in the dry scrubber. These are changed every three months, and their use has been found to be satisfactory. So far as known, this is the only plant in the state making such use of cotton-seed hulls. The other is the riveting together of the grate bars in the producer in sets of three, so as to prevent warping. Here, as elsewhere with this type of producer, the only source of moisture for the blast is the water in the ash-pit. No data is available concerning the consumption of fuel per brake-horsepower or per kilowatt-hour.

TEAGUE ELECTRIC LIGHT AND POWER COMPANY.

Equipment: one Fairbanks-Morse suction up-draft producer of 100 horsepower and one Fairbanks-Morse two-cylinder vertical gas engine of 100 horsepower. The engine is belted to a 75-kilowatt Fairbanks-Morse alternator at 1,150 volts for driving a double battery of cotton gins.

The plant was installed about three and one-half years ago to supplement steam. The steam plant was operated with oil as fuel and the engine was a Skinner automatic, belted to a Fairbanks-Morse generator. The producer plant operates steadily twenty-four hours a day and seven days in the week on a fuel consumption of 6,000 to 7,000 pounds of lignite a day. The lignite costs $2.25 a ton, delivered. On full load the consumption of lignite is about three pounds per brake-horsepower. about a barrel of tar is made every twenty-four hours, but no attempt is made to save this or the ammoniacal liquor. The engine exhausts into an underground muffler, with no water heater anywhere on the line. The only moisture available for the blast is from the ash-pit. The ashes seemed to be free of combustible matter, and no large clinkers were observed.

Two men on each shift and two shifts a day is the practice here. The producer is charged every hour, rodded down and the ashes drawn on a regular plan. Thus, rod on the half hour, charge on the hour and draw ashes immediately after charging.

An individual induction motor has been installed to drive the scrubber, as the engine is too distant.

TEAGUE ELECTRIC AND POWER COMPANY.

Equipment: one 50-horsepower Fairbanks-Morse suction up-draft producer and one 50-horsepower engine of same make, horizontal, single cylinder. This engine is belted to a 30-kilowatt Fairbanks-Morse alternator. There is also one 100-horsepower Fairbanks-Morse suction up-draft producer and one 100-horsepower two-cylinder vertical gas engine of same make. This engine is belted to a 75-kilowatt Fairbanks-Morse alternator. The entire plant is idle from 6 a. m. until 9 a. m. The larger unit requires about 1,500 pounds of fuel for six hours and the smaller about 3,000 pounds for fifteen hours. The lignite used costs $1.80 a ton, delivered. The small plant was installed in April, 1908, at a cost of about $7,200. The addition was installed in December, 1909, at a cost of about $13,000.

The scrubber water and tar are led through a barrel flush with the surface. The tar flows over the top of this barrel into open ditches. The water is conveyed from the bottom of this barrel to a second barrel, and thence is pumped to a cooling tower and returned to circulation. The engine jacket-water is similarly cooled, in a separate tower, and used again. The only use made of the tar is for treating the butts and cross-arms of poles. From 20 to 25 gallons of tar are produced daily. Each of the tar extractors is driven by an independent motor and the same blower serves both producers. The producers are charged every two to three hours and the clinker is broken out from the bottom every hour. The ashes were free of combustible matter and no large clinkers were observed.

Natural Gas for Fuel.

Natural gas is burnt under the boilers of the Union Gas and Electric Company, Cincinnati, O. Coal is used only for banking and emergency purposes.

Electric Lighting and Illuminating Engineering

ILLUMINATION IN EUROPE.

MEETING OF CHICAGO SECTION, ILLUMINATING ENGINEERING SOCIETY.

The opening meeting of the season of the Chicago Section of the Illuminating Engineering Society was held on the evening of October 19, and was preceded by dinner in the Kuntz-Remmler Restaurant. The speaker was Herbert E. Ives, vice-president of the Section, his subject being "Random Notes on Lighting and Life in Europe."

Dr. Ives described a recent trip through Europe, commenting upon the different methods of illumination which have been used there and devoting especial attention to Athens and Italy, where so many examples of ancient architecture abound. He speculated upon the methods used by the ancients in illuminating their buildings and came to the conclusion that daylight illumination must have been relied upon almost entirely. Modern buildings in Athens and in Italy are very poorly illuminated and show almost no knowledge of the art of illuminating engineering. Europe is far behind America in indoor lighting.

The buried city of Pompeii near Naples presents an opportunity to study the arrangement of the buildings and the lighting used in olden times even better than the larger buildings some of which are in ruins and nearly all of which have lost the roof, which would probably have been the key of the source of interior lighting. The buildings of Pompeii have been excavated and one can make a study of the arrangements. While crude oil lamps and candelabra have been found in some of these buildings, there seems to have been little artificial illumination, high windows and openings in the roof being depended upon largely for daylight illumination. Many of the buildings have no exterior windows, but the rooms receive light by being open on an interior court. This method is quite common today in Italy, as many of the city shops are open to the street and depend upon this means alone for light.

The Pantheon in Rome is the only old building which the speaker had observed with adequate lighting. It is well lighted by an opening in the center of the dome. The church of St. Peter has no provision for artificial lighting and consequently no evening services can be held there. The church at San Miniato, near Florence, has a crypt which is lighted through windows made of thin translucent marble. Most of the picture galleries and indeed the majority of all the buildings observed by the speaker in Europe have very poor interior illumination. Clear bulbs in open wiring are customary and very little use is made of diffusing glassware or other means for avoiding glare. Some good examples of the application of glassware were observed in London, but those were exceptions. One instance noted, where glare had been avoided, was in a compartment of a railroad car, where the reading lamp had been painted in front so as to avoid glare. Metal-filament lamps are common.

Street lighting, on the other hand, is well developed in most of the cities in Europe and many excellent examples were found. Even here, however, he did not find any installations which were superior to the best which can be found in this country, such as, for instance, Michigan Boulevard in Chicago.

In Venice, Italy, street lighting becames a problem of canal lighting, a problem which is complicated by the fact that all the lights are reflected in the water and it is difficult to place them so as to obtain good illumination. The Moors in Cordova were the first to attempt street lighting. This was done in the twelfth century and progress since then has been continuous.

The discussion consisted mainly in questions which were propounded to the speaker to bring out particular aspects of European lighting. Messrs. Cravath, Vaughn, Schuchardt, Scheible and Aldrich joined in this discussion. In reply, Dr. Ives stated that he had observed flaming arcs mounted fifty feet high in some places, such as on the gates forming an entrance to the parks in Berlin. London is a collection of boroughs some of which are using gas and some electric current for street lighting. They are all well lighted, but seldom artistically lighted. While the scientific development of illuminants has largely been made in Europe, the applications are generally inartistic. There is usually more light than in American installations but it is not so well applied. High-pressure gas arcs are used in some places and are rivals of the flaming arcs. Little attention was paid by the speaker to factory illumination.

The meeting closed with a report from the Convention Committee read by Secretary Eustice. Among other things it was mentioned that thirty-one new applications for membership had been made during and since the convention.

October Meeting of Car-Lighting Club.

A very successful meeting of the Car-Lighting Club was held on the evening of October 18, in the Kuntz-Remmler Restaurant, Chicago. The feature of the program was the paper by R. C. Lanphier, entitled, "Ampere-hour Meters," which dealt with the design, construction and operation of these instruments and their application to car-lighting work. The paper was illustrated by lantern slides.

AMPERE-HOUR METERS.

This paper describes the construction of an ampere-hour meter and explains its function. The ampere-hour meter is of the simplest possible construction, having no moving wires or coils to get out of order, and the copper armature, being completely immersed in mercury, gives a flotation to the entire moving system so that no amount of jarring and vibration can damage the moving system or the recording mechanism driven from it. While an ammeter and voltmeter show the instantaneous conditions, they do not indicate the state of battery charge as does the ampere-hour meter. The latter may be arranged with a differential shunt, so as to record faster on discharge than on charge. The ratio of the two rates can be adjusted to suit the ampere-hour

efficiency of the battery. The meter will then run just as far back on charge as it runs forward on discharge, and its condition with respect to charge is evident at all times. The meter can be arranged to automatically control a circuit-breaker in the charging circuit, and thus stop the charging current when the battery has received the proper charge. Meters can also be arranged for totalizing the charge or discharge. Such meters record only when the current passes in one predetermined direction. Recently a type of meter has been designed in which the charge and discharge are recorded separately on two sets of dials. The two records may be made to show kilowatt-hours input and ampere-hours output. The type of ampere-hour meter developed particularly for use with axle-driven car-lighting equipment, is that having the duplex recording train, consisting of a dial with two rows of totalizing or integrating circles. One row records discharge and the other charge, the gears for the indicating hands of each row being driven through a ratchet arrangement so arranged that when the hands on the discharge row are moving, the hands on the charge row do not move, or vice versa. With this type of recording train, the entire charge or discharge of a battery is recorded on a single dial except in cases where there are extremely rapid changes from charge to discharge, which do not occur in railway-car-lighting service. The meter with duplex train is very useful with axle equipment, as a comparison of readings of the charge and discharge circles from day to day enables an inspector to see just how much overcharge the battery is getting, and thus to set the regulating feature of the equipment so that the battery will not be seriously overcharged, as has been so common in railway practice.

F. E. Hutchinson opened the discussion, reciting briefly his experience with ampere-hour meters. He asked if the mercury contained in the meter would not vaporize if the instrument was subjected to extreme heat. Mr. Lanphier said that the meter could stand temperatures of from zero to 160 degrees without harm.

C. R. Gilman spoke of the increased care a storage battery is given if an ampere-hour meter is provided to indicate its performance.

George B. Colgrove explained that the only trouble experienced with these meters was in the matter of readings. This, however, was simply a matter of educating those whose duty it was to read the meters.

Numerous questions were also asked Mr. Lanphier regarding details of the meter, its performance, etc. H. W. Young, George W. Cravens, Otis B. Duncan and others participating in the discussion. Before concluding the subject a number of interesting applications of ampere-hour meters were described.

Before adjournment Chairman Farrelly called attention to the November meeting which would be "Ladies' Night." The meeting will be held in the Hotel La Salle, Chicago.

Training Commercial Men in the Fundamentals of Illumination.

At the meeting of the Philadelphia Section of the Illuminating Engineering Society, October 20, Sydney W. Ashe presented a paper describing the training courses established by the General Electric Company for teaching its lamp salesmen the fundamentals of illumination.

In introducing the subject Mr. Ashe analyzed the methods of the vocational schools of the German Empire, and commented upon the great measure of industrial success that obtained there because of the high percentage of college-trained men at work in the industries. He also emphasized the characteristic thoroughness of the German and held that something of this thoroughness, coupled with the vigor and ingenuity of the American commercial man, would produce a highly successful combination.

In the training courses described all classes of individuality are encountered, and although the matter of combining technical ability and selling instinct is difficult, it is sometimes astonishing how readily the adaptation is accomplished.

The method of instruction used is of interest. A general scheme is worked out and printed in the form of a syllabus, giving in detail the program to be followed for each hour of the three week's course. This program must be flexible for it is difficult to follow even when well laid out. The men are coming and going at all times. They are of all degrees of intellect and personality, for one can readily see that there are all classes of customers which must be dealt with. The period which the men can devote to the work also varies widely from one week to a couple of months. For instance, a new man must spend three weeks. A man from the field may need only a week to be informed on all of the new developments or a new man for some territory such as South America may stay two months.

In the beginning use is made largely of the experimental method of teaching either by lectures or by actual laboratory work by the men. When a man has measured the resistance and wattage consumption of a few lamps and has varied the voltage from zero to 220 volts over a combination of carbon, Gem, tantalum and Mazda lamps, he gets an excellent idea of the characteristics of lamps under operating conditions. If he then measures the intensity on a plane of a lamp hung at different heights by means of a luminometer he realizes what a difference the height of lamps makes, and he then appreciates the application of the inverse-square law. In addition to his experiments he learns how to use distribution curves and what such a curve actually means.

A series of illustrated lectures on sign lighting, store and window lighting, street lighting, residence lighting, etc., gives him some idea of the use of lamps. By arranging a series of evening excursions in New York he can visit many notable installations. Occasional trips through the lamp factories make him familiar with lamp manufacturing and finally a series of selling talks which he gives enables a study of his personality, and he is advised regarding methods of approach, demonstration, closing contracts and methods of securing business. In addition to all these things the man is drawn into the company's atmosphere by means of daily after-dinner club meetings in which he meets his superiors.

Water Sterilization By the Ultra-Violet Rays.

Grimm and Wedert report that with a quartz lamp with a double quartz bulb for burning under water a light of 1,200 Hefner candles, they sterilized 120 gallons of comparatively pure water per hour, and 100 gallons of water full of bacteria. As might be expected, the action is only satisfactory with clear, colorless water, as only such water can be thoroughly penetrated by the rays. Yellow peat water, for example, is not purified by the ultra-violet rays. The following is the estimate of cost for 50,000 hours' work: Quartz lamp, $50; resistance, $11; new burners, $600; current, $1,100; sundries, $14. This gives a total of nearly $1,175 for sterilizing five million gallons, or at the rate of thirty gallons for a cent. The cost can be greatly reduced by stopping a little short of complete sterilization. It is said that ninety gallons can be brought to 99 per cent of full sterilization for a cent. Even then the process costs twice as much as the ozone treatment, and that again five time as much as sand filtration.—*Electrical Engineer.*

Telephony · Telegraphy and Wireless

Wireless Telegraphy from Aeroplanes.

A preliminary series of experiments has been conducted in France by Captain Brenot with an equipment for wireless telegraphy, supplied by the Société Francaise Radiotélégraphique and fitted on a Henri Farman biplane.

The energy is furnished by the Gnome motor of the aeroplane, which drives a special magneto and charges the antenna direct. By regulation of the antenna and the oscillator the operator can control the length of the wave and the amount of energy radiated. The antenna consists of a bronze wire one millimeter in diameter, which passes through jointed insulating tubes and is unwound behind the aeroplane. A chisel with insulated handle enables the wire to be cut in case of need, as, for example, if at the moment of landing there is no time to wind it up. The wire is about 400 feet long. In the course of the experiments it has been found possible to send messages regularly to distances of from thirty-five miles to nearly fifty miles. The total weight of the equipment, including the wire, is forty-six pounds.

Telephone Pioneers of America.

The Telephone Pioneers of America will meet at the Hotel Somerset, Boston, Mass., Thursday and Friday, November 2 and 3. The Organization Committee consists of Henry W. Pope, Charles R. Truex and Thomas B. Doolittle, with headquarters at 26 Cortlandt Street, New York City.

The program for the meeting is as follows:

THURSDAY.

Morning, 10 a. m.: Organization.

Afternoon: Addresses by Alexander Graham Bell, Thomas D. Lockwood and others.

Evening: Theater.

FRIDAY.

Morning: Visiting Main Exchange.

Afternoon: Automobile ride, taking in Concord, Lexington and suburbs of Boston.

Evening: Formal banquet.

Special railroad rates may be obtained by application to R. H. Starrett, chairman Transportation Committee, 15 Dey Street, New York City; and hotel accommodations may be secured by addressing the Committee or Henry McDonald, chairman, American Telephone and Telegraph Company, Boston, Mass.

All attendants are requested, if they have anything of telephonic, historical significance, to bring it with them, and facilities will be provided for exhibition. It is estimated that the attendance will be between 200 and 300.

The list of Pioneers registered to date is published below, and it will be seen that, by years, they are in number as follows:

1875	3	1883	32
1876	5	1884	33
1877	28	1885	29
1878	39	1886	14
1879	52	1887	21
1880	38	1888	24
1881	35	1889	30
1882	35	1890	21
		Total	439

It will be seen that there were three pioneers in the telephone business before the invention was patented in 1876. They were working on the telephone in 1875, and were Alexander Graham Bell, Frank W. Harrington and Thomas A. Watson.

LIST OF MEMBERS OF THE PIONEER ASSOCIATION.

NAME.	DATE OF ENTERING SERVICE.
Abbott, E. W.	January, 1884
Abbott, William Rufus	March 1, 1889
Adee, Daniel M.	June, 1878
Adkins, W. H.	1878
Adler, C. H.	April 1, 1878
Allen, A. M.	February 1, 1880
Allen, H. E.	May, 1885
Allen, Albert P.	August, 1890
Avis, C. D.	June 30, 1890
Badour, W. H.	May, 1884
Bailey, Thomas B.	February 28, 1878
Baker, Ellis B.	January 31, 1878
Baker, Hugh C.	October 18, 1877
Baker, K. S.	April 22, 1882
Baker, P. K.	1885
Baker, Wm. H.	July, 1886
Bangs, C. R.	November 1, 1888
Bangs, Edward H.	January 9, 1888
Barrett, A.	May 1, 1883
Barrett, John A.	July, 1881
Barry, J. H.	April 30, 1884
Barton, Enos M.	1876
Bates, H. G.	1884
Bawsel, E. E.	February 6, 1878
Baxter, M. S	April, 1879
Beamer, James	May 1, 1881
Bedlow, F. E.	July 18, 1887
Bell, Alexander Graham	June, 1875
Bell, Edward W.	February, 1889
Bell, W. E.	November 1, 1890
Bellard, H. W.	June, 1882
Berliner, Emile	September, 1878
Bender, Arthur F.	1881
Berry, W. J.	July 1, 1889
Berthold, Victor M.	September 20, 1883
Bethell, F. H.	November, 1890
Bethell, U. N.	1888
Betts, George E.	June 1, 1878
Blake, Adelle W.	June, 1885
Blake, Francis	1878
Blake, J. T.	March, 1882
Blood, Jno. L.	September 3, 1889
Bloodgood, F. S.	April 14, 1880
Boeggeman, J. H.	May, 1878
Boutillette, H.	1879
Boyce, C. L.	October 8, 1879
Boynton, F. J.	September, 1881
Bradshaw, Thos. N.	1884
Breckenridge, Henry W.	June 10, 1879
Brennan, J. P.	November, 1880
Brown, Joseph M.	May 1, 1879
Brown, N. Warren	November 22, 1882
Brown, Robert	1877
Brown, Thomas S.	August, 1885
Brown, Walter	January 1, 1888
Brownell, C. H.	1879
Buehler, M. H.	December 16, 1882
Bunton, W. W.	October 1, 1889
Burgess, E. M.	November 1, 1881
Burleigh, Chas. B.	August, 1879
Bush, W. H.	April 23, 1880
Butler John K.	1878
Buttrick, F. A.	August, 1879
Bryne, C. J.	August 1, 1879
Cahill, John H.	May 5, 1880
Caldwell, James E.	May 1, 1885
Campbell, A. S.	August, 1885
Candee, Willard L.	August 31, 1877
Canfield, James F.	December, 1885
Carney, M. J.	July, 1879
Carpenter, I. B.	1882
Carrigan, G. H.	June 30, 1879
Carter, O. H.	February 1, 1884
Carty, J. J.	1879
Chambers, J. A.	June, 1881
Chapman, Wilson S.	November 1, 1879
Childs, W. A.	May, 1877
Christie, J. W.	July 12, 1884
Clark, E. A.	April 1, 1883
Clarke, E. N.	July, 1880
Clifford, J. M.	September, 1889
Cline, J. H.	January 1, 1889
Cline, Robt.	1888
Clower, D. M.	1881
Cochran, R. B.	February, 1884
Cole, Charles D. M.	December, 1889
Cole, Minnie E.	December 1, 1884
Collins, Dennis L.	May 11, 1882
Conn, F. W.	August, 1879
Conoley, C. H.	January 9, 1889
Cook, W. R.	March 1, 1882
Cornish, Thomas E.	1878
Corrigan, Edward	June 21, 1883
Cottrill, E. B.	October 10, 1886
Cox, D. C.	December 15, 1889
Crawford, John	1887
Crenshaw, A. P.	September 22, 1878
Crews, J. William	May, 1883
Crouter, G. W.	July 1, 1883
Culbertson, J. N.	April, 1878
Cunningham, John	February 1, 1889
Curl, Harry J.	1888
Cutts, A. E.	June 10, 1890
Daboll, Frank G.	March 21, 1879
Dawson, W. E.	1887
Day, C. B.	1884
Delano, Frederick M.	1878
Delany, George W.	October 1, 1878
De Lany, W. W.	October, 1887
Dement, A. K.	June 1, 1890
Denver, W. J.	1877
Depuy, A. B.	September, 1883
Devonshire, Robert W.	August, 1877
Dickinson, Chas. G.	December 20, 1882
Dittmer, Adolph M.	May 14, 1888
Dodd, Amzi	November 1886
Donohoe, Francis E.	June 30, 1882
Doolittle, Charles B.	July, 1878
Doolittle, Thomas B.	June, 1877
Dovle, James	August 15, 1885
Driver, W. R.	1880
Dunstan, Kenneth J.	October, 1877
Durant, Charles	May 1, 1888
Dusenbury, Thomas	January 1, 1883
Dwyer, T. J.	1881
Eanes, H. O.	August 1, 1880
Eddy, W. B.	1879
Egleston, Melville	1885
Ehrlich, Herman	1877
Ellis, W. P.	May 1, 1884
Embler, A. H.	May, 1882
Emery, Howard B.	June, 1889
Ennis, U. P.	November 17, 1883
Esten, W. E.	1880
Evans, William R.	September 25, 1878
Failing, C. C.	1883
Farnsworth, J. E.	1885
Ferry, J. M.	September 11, 1886
Field, E. B.	January 21, 1880
Field, E. B., Jr.	January, 1887
Field, Stephen D.	1877
Fish, Frederick P.	November 26, 1881
Fitch, D. H.	1879
Fitzpatrick, Thomas P.	1879
Flanagan, James H.	August, 1882
Forbes, Frederick A.	October, 1882
Ford, E. C.	October, 1882
Ford, Wm. A.	July 1, 1884
Foster, Geo. W.	March, 1882
Fraser, C. K.	May 10, 1889
Freedy, B. L.	October 1, 1881
Fuller, Charles H.	May 1, 1886
Fullerton, D. P.	December, 1889

NAME.	DATE OF ENTERING SERVICE.
Gallagher, A. C.	April, 1879
Gannon, Mary J.	1883
Gardner, C. E.	October, 1879
Garvey, W. J.	September 1, 1880
Gately, Joseph A.	June 26, 1889
Gates, C. A.	February 7, 1885
Gentry, W. T.	1879
Ghegan, John J.	1877
Gibbs, D. R.	May, 1888
Gibson, J. W.	November 27, 1882
Gillespie, James W.	June 22, 1883
Glidden, Charles J.	May 8, 1877
Good, W. G.	May, 1880
Graham, Willard	May, 1883
Grant, Charles A.	March 26, 1883
Green, Arthur B.	1889
Greer, Samuel Miller	August, 1890
Griffin, F. W.	December, 1887
Gruber, Adolph A.	December 16, 1887
Gurnee, E. Alonzo	May, 1885
Hall, Charles E.	April 1, 1884
Hall, Edward J.	November, 1878
Hall, Laura M.	September, 1885
Hanchett, W. D.	1879
Harrington, Frank W.	1875
Hathaway, J. F.	July 15, 1888
Hayes, Hammond V.	December 7, 1885
Hays, W. S.	January 1, 1881
Heep, W. G.	November 12, 1885
Helsher, Louis H.	December 3, 1879
Henderson, J. S.	June 11, 1883
Hennigh, Minnie M. E.	1882
Herzig, Andrew H.	October 19, 1884
Hibbard, Angus S.	July, 1881
Higgins, P. Kerr	September, 1881
Hoffman, Miss Sue	March 4, 1884
Holcomb, Alfred E.	1890
Holmes, E. T.	May, 1877
Hoover, Robert B.	April 1, 1881
Hoppins, W.	March, 1888
Houston, Francis A.	March, 1885
Howard, Charles T.	January 16, 1880
Howarth, Walter S.	February 11, 1884
Hoyt, G. W.	January, 1883
Hubbard, Charles Eustis	August, 1877
Huebner, S. T.	1882
Huidekoper, H. S.	January 1, 1886
Hume, Leland	October 16, 1885
Huntington, W. E.	July 1, 1882
Hussey, E. A.	April 25, 1887
Hutt, W. C.	November 25, 1883
Hutton, N. H.	1885
Hyde, Henry D.	1879
Hyde, W. H.	December 20, 1883
Ingalls, S. C.	December, 1886
Ingram, Miss Bessie	August 15, 1889
Ingram, Thomas L.	February 2, 1881
Ives, A. W.	February, 1884
Jackson, W. A.	October 1, 1877
Jacobs, P. O.	September, 1890
Jacobs, W. J. C.	May, 1884
Janke, C. A.	July 10, 1880
Johnson, W. W.	June 10, 1884
Joyce, Martin J.	November, 1877
Kaiser, Barney A.	October 17, 1885
Kearns, John	September, 1879
Keech, T. J.	April 1, 1881
Keenan, W. J.	1879
Kelleher, Charles F.	October, 1878
Keller, Jasper N.	1879
Kennedy, James A.	July, 1884
Kesterton, W. H.	September, 1890
Keys, Miss Betty E.	May 1, 1882
Kilbourne, W. H.	November 1, 1879
Kinnard, L. H.	June, 1888
Kinsman, F. E.	1876
Knetzer, John E.	January 1, 1890
Knight, Frank B.	May, 1880
Korty, L. H.	November, 1877
Kraft, Hermann	October, 1885
Ladd, J. W.	1878
Lane, M. J.	1885
Larned, S. J.	July 1, 1890
Lewis, Frederick P.	July, 1882
Leverett, George V.	February, 1886
Liesinger, Theodore L.	December 1, 1887
Lillie, Edward E.	April, 1879
Lillie, N. W.	October 8, 1877
Litton, R. N.	April, 1880
Lloyd, B. F.	1883
Lockwood, Thos. D.	1878
Lohmes, Hardy T.	April, 1883
Long, Thos. F.	1882
Longley, Edmund W.	September, 1881
Lyon, E. H.	October, 1880
Lyons, J. H.	August, 1889
Maben, J. G.	February 27, 1888
MacCrellish, John A.	February 1, 1881
Macdonald, J. E.	March 12, 1888
Mackenzie, Cecil W.	April 1, 1879
Madden, L. A.	1888
Maiden, Wm. J.	October, 1882
Manson, George T.	December 7, 1879
Many, Augustus	February 8, 1882
Marriott, S. H.	August 12, 1889
Marshall, H. P.	July 27, 1885
Martin, J. J.	April, 1878
Martin, T. Commerford	1878
Martin, William D.	June 15, 1883
Mason, F. C.	October, 1877
Maynard, Geo. C.	1876
McAdoo, J. D.	January, 1885
McCabe, J. Albert	February, 1889
McCluer, C. E.	1876
McComas, R. T.	September 1, 1878
McCoy, Edwin L.	1885
McCoy, H. A.	1883
McCoy, John A.	1878
McCully, Harry G.	July 1, 1880
McDaniel, Charles W.	May, 1879
McDonald, Henry	November 27, 1887
McDonough, F. J.	1881
McDonough, James	1886
McElligott, E.	August 1, 1887
McFarland, G. E.	1880
McFarlane, Lewis B.	July, 1879
McLellan, Alexander	1879
McLeod, John D.	1886
McLoughlin, W. J.	May, 1882
McMeen, S. G.	January, 1885
McQuarrie, J. L.	July, 1882
Meany, Edward P.	July 1, 1886
Mehaffey, J. H.	September, 1878
Mellen, A. J.	January, 1883
Menzies, James	1881
Meyers, S. H.	March, 1884
Milburn, T. W.	January, 1882
Miller, Norton	September, 1884
Milne, G. D.	April, 1879
Milton, W. B.	July 1, 1887
Moody, John F.	October 27, 1889
Moore, R. A.	December 15, 1889
Moran, James T.	September, 1884
Moran, Jno. M.	August 6, 1879
Morgan, Richard J.	August 1, 1890
Morgan, William J., Jr.	April 20, 1890
Morris, S.	June, 1887
Mosley, Chas. E.	April 1, 1889
Murphy, D. J.	January, 1881
Murphy, E. L.	September 5, 1885
Murphy, J. O.	June, 1877
Murphy, John F.	April, 1880
Nelson, Frank G.	September 1, 1888
Nesbit, T.	March, 1880
Newton, Walter R.	June 10, 1890
Nicholson, Chas. A.	November, 1879
Nicholson, W. W.	January, 1881
Noyes, W. I.	November, 1880
O'Brien, Richard	1877
O'Brien, P. W.	1880
O'Hea, J. F. X.	December 18, 1889
Olheiser, W. W.	1884
Oliver, B. A.	October 13, 1883
O'Rourke, John	January, 1881
Overbeck, Frances	May 19, 1883
Ovitt, C. L.	1883
Owens, Archibald A.	February, 1889
Paynter, W. D.	January 1, 1879
Peaty, John C.	1881
Peckham, Fenner H.	July 13, 1883
Perkins, W. B.	December 5, 1887
Phillips, A. D.	July, 1881
Pickernell, F. A.	1886
Pierce, George W.	February 5, 1880
Pigott, Thomas E.	February 1, 1880
Pitman, Charles W.	March, 1884
Pittman, Edward Y.	June, 1879
Platt, G. P.	July 1, 1890
Pond, George S.	September 1, 1883
Pope, Henry W.	1877
Powell, Frank	September 1, 1890
Powell, T. L.	February 14, 1884
Price, Charles W.	December, 1882
Raup, K.	October, 1880
Ray, M. D.	March 10, 1884
Reilly, Peter T.	April, 1887
Reynolds, P. G.	July 22, 1881
Richards, W. L.	1878
Robb, James	October 26, 1888
Roberts, A. P.	November, 1880
Rogers, E. B.	September 1, 1887
Rolfe, Charles A.	March, 1877
Root, Charles M.	January, 1879
Ross, Frank C.	December 17, 1880
Ryan, Isabella B.	February, 1882
Salt, A. L.	July 7, 1881
Sapp, H. T.	September 3, 1883
Schoch, Jacob	April 15, 1889
Schultz, H. J.	December 26, 1878
Scribner, C. E.	1877
Seely, C. G.	November 15, 1881
Sherwin, Thomas	March, 1883
Sherwood, E. F.	June 10, 1879
Silvers, Olive	June 21, 1889
Simpson, F. C.	September, 1890
Sise, C. F.	January, 1880
Skolsky, Phillip Jacob	1882
Sloan, W. D.	July, 1880
Smith, A. T.	December, 1879
Smith, Alonzo W.	March 16, 1880
Smith, Charles H.	October, 1890
Smith, Chauncey	October, 1888
Smith, C. B.	April 21, 1889
Smith, Emor A.	January, 1882
Smith, Frank E.	November 1, 1881
Smith, Sidney H.	September, 1880
Smith, S. Fred	March 7, 1881
Snelling, H.	1885
Snook, Stephen D.	May, 1880
Soderstrom, John	November 1, 1889
Sommers, H.	September, 1887
Spencer, P.	August, 1884
Sperry, Walter N.	November 1, 1880
Stanford, Joseph D.	November, 1879
Starrett, R. H.	October 15, 1888
Starrett, S. H.	August 1, 1887
Stedman, W. H.	October 2, 1882
Stearns, J. W.	March, 1879
Stitt, J. K.	May 1, 1883
Stone, A. C.	October 1, 1881
Storke, H. L.	June, 1879
Strout, Harry	July 11, 1887
Sunny, Bernard E.	March 1, 1879
Swaney, F.	June 1, 1887
Taylor, Edgar L.	1884
Taylor, William F.	June 10, 1888
Thayer, H. B.	January, 1881
Thomas, M. F.	February, 1879
Thompson, A. K.	1878
Thompson, George K.	May 15, 1882
Thomson, M. A.	May 20, 1889
Throop, B. J.	March 1, 1881
Toomey, Florence T.	April 4, 1890
Truex, Charles R.	September, 1879
Truex, William H.	October, 1888
Tulloch, G. S.	July, 1887
Tuttle, Alonzo W.	July 25, 1885
Uhrig, Frederick B.	October, 1881
Vail, J. Cummnigs	June, 1880
Vail, Theo. N.	1878
Vaille, Frederick O.	November, 1878
Vaille, Howard T.	December 26, 1882
Vaughn, W. W.	1884
Van Buren, George M.	1884
Vance, Henry C.	1888
Wadland, Thomas H.	November, 1878
Wainman, C. P.	1877
Walker, Clement I.	July 15, 1890
Wallace, Geo. Y.	1883
Warner, Frank E.	December 1, 1879
Warth, N. G.	January, 1880
Wass, James K.	1886
Watson, H. P.	1881
Watson, Thomas A.	June, 1875
Weaver, W. H. M.	1887
Welch, J. J.	1888
Westbrook, W. T.	April, 1878
Whalen, J. B.	January 1, 1882
Wilde, Charles E.	November 13, 1884
Wilder, H. W.	1881
Wiley, J. R.	1878
Wiley, George L.	1877
Willard, Edmund S.	May, 1879
Wilson, Charles H.	1877
Wilson, D. Leet	January 8, 1880
Wilson, Eugene M.	May 17, 1879
Wilson, J. W.	August 1, 1885
Wilt, George P.	July 19, 1886
Woelk, Edward A.	June, 1878
Wood, F. G.	1877
Woolverton, W. H.	1878
Wright, R. L.	May 1, 1884
Wright, I. O.	July 1, 1890
Wright, Walter A.	1888
Yensen, P.	January, 1884
Yost, C. E.	August, 1889

Since this movement was inaugurated, in the present year, there have been four deaths, as follows:

Henry M. Watson, April, 21 (1878).
Frederick A. Allen, June 19 (1878).
William N. Eastabrook, June 30 (1879).
William Dunlap Sargent, August 10 (1876).

Wireless System for the Philippine Islands.

The Joint Wireless Board, consisting of Secretary C. B. Elliott and several army and navy officers, has made a lengthy report in which it recommends that a complete system of wireless telegraph be installed in the Philippine Islands for the use of the civil government and the army and navy. The report calls for thirteen principal stations, beginning with Batan Island north of Luzon and extending to Jolo on the south. Also fourteen intermediate and low-power stations are recommended. The estimated cost of installation is $300,000, of which amount it is urged that Congress on behalf of the army and navy appropriate $165,000, the insular government to provide the remainder.

Wireless in Africa.

Italy is connecting itself with its African colonies by means of wireless. Wireless stations already exist at Massowah and Mogadiscio, which bring the two colonies into communication. A big installation is to be made at Coltano near Pisa, which will communicate with Massowah. The distance from Coltano to Masowah, is 2,500 miles. The distance between Massowah and Mogadiscio is 1,120 miles.

Industrial Power

THE APPLICATIONS OF ELECTRICITY IN THE METALLURGICAL INDUSTRY OF ITALY.[1]

BY R. CATANI.

The development of the use of electricity in recent years has greatly benefited the metallurgical industry in many ways, as a means for driving the auxiliary machinery of metallurgical apparatus, blast furnaces and mixers, the hoisting and transport of raw and finished materials, and the driving of rolling mills. The last and most important development, however, is that of furnaces dependent for their heat upon the thermal effects of the electric current. The Italian metallurgical industry has also largely benefited by the introduction of electric energy, but it is proposed to confine this report mainly to an account of the furnaces and electric processes applied in Italy to metallurgical production.

PRODUCTION OF STEEL OR IRON IN THE ELECTRIC FURNACE.

In Italy steel is manufactured in the electric furnace either direct from ores or from iron products, and, indeed, the first experiments in the direct production of steel from ore in the electric furnace were made at Rome by Stassano in 1898.

The problem of the direct reduction of steel from the ore presents difficulties of such a kind as to deter many metallurgists, however well skilled, from attempting to solve it. The numerous experiments carried out last century in the endeavor to attain this object, using fuel from coal, met with no success on a commercial scale. On the other hand the results of a few years' trial with the electric furnace have surpassed expectation, and it may be affirmed with certainty that, in due time, by the aid of the electric furnace, the problem of producig steel by a direct process on a commercial scale will have been overcome. Nevertheless, the experiments of the last century cleared up several essential points which have assisted greatly in the further development of the process. In Stassano's experiments at Rome the charge was prepared in the same manner as in previous attempts to effect the direct reduction of ore with fuel from coal. The material was first crushed, pressed into briquettes with tar, and finally treated in the electric furnace. Recent trials have shown, however, that in the electric furnace it is equally easy to treat the ore whether in a fine state or in lumps, and hence it is possible to dispense with the preparation of the raw material, which forms a not inconsiderable item in the first cost of the steel. The early experiments of Stassano, as stated by him in 1902, led to no practical results for the reason that he adhered too closely to blast-furnace practice, both in regard to the shape of the furnace and the process itself. In fact, the first furnace used at Rome in 1898 to 1899 was a shaft furnace in which, instead of having tuyeres for blowing, electrodes were provided for conducting electric current. As to the method of smelting, Stassano arrested the ore by means of a grating at a distance of about twenty centimeters above the electric arcs. The experimental furnace afterwards put up at Darfo did not differ very materially from that at Rome, nor were the results much better than those previously obtained.

Stassano finally adopted a furnace of the hearth type; the principal characteristics were that it was roofed over, and long electric arcs played between the mass of the charge and the arch of the furnace. The arcs swept the surface of the slag without passing through it; the heat, therefore, was not imparted direct by the contact with the slag or the molten mass, but passed indirectly into the bath by radiation. The electrodes had a high density, and were held in water-cooled supports. The furnace was completely closed in, and provision was made for collecting and carrying off the gases evolved during the process.

Some Stassano furnaces are fixed, others can be rotated. In some the only rotary movement is that of tilting towards the side of the tapping hole so as to facilitate tapping. Others can be rotated on their vertical axis so as to stir the bath. Single-phase current with one or more pairs of electrodes or three-phase current can be used. Stassano's experiments for the direct production of steel by means of his electric furnace may be divided into two groups, namely, those performed during the years 1898 to 1902, the results of which were published in the *Rivista di Artiglieria e Genio*, March, 1902, and those which were published in 1908 in the *Giornale del Genio Civile*.

With the electric furnace the general practice is to use pig iron for the production of iron and steel in the same manner as in the ordinary type of furnace, in which case the material can be charged into the furnace in either the liquid or the solid state. The consumption of electric energy diminishes rapidly the greater the amount of heat stored in the materials when charged, and the greater the degree of the purity of these. Table I shows the approximate power consumption in certain cases taken from actual practice.

TABLE I.—Kilowatt-hours necessary for the production of a ton of steel (Rodenhauser-Schoenawa Furnace).

	Kilowatt-hours.
From cold pig iron	1500
From liquid pig iron	1100 to 1200
From cold pig iron and cold scrap	900 to 1300
From liquid pig iron and cold scrap	600 to 1000
From cold scrap	300 to 900
Refining.	
	Kilowatt-hours.
Steel of crucible quality from liquid iron	200 to 300
Ordinary electric steel from liquid iron	120
Mixer	50

In general, where electric energy is costly, it is convenient to refine only liquid charges in the electric furnace, but steelworks are not always in the neighborhood of electric power stations of sufficient capacity to supply energy at reasonable prices. In that case it is necessary to melt solid charges in the furnace. The raw materials consist generally of pig iron, scrap, ore and additions.

The first installation in Italy was that of Stassano at the Royal Artillery Works at Turin, established by the Italian Ministry of War. That furnace has been in operation since 1903, and

1 Abstract of a paper presented before the Iron and Steel Institute at London, Eng., October 5, 1911.

is of 200 horsepower. Subsequently there was formed in Italy the Stassano Electric Furnace Company, which established an electric steelworks at Turin. The electrical characteristics and the number of these furnaces were as follows:

No. of Furnaces.	Horse-power.	Kind of Current.	Volts.	Amperes.
2	100	Single-phase	75	1000
2	200	Three-phase	100	900
2	1000	Three-phase	150	2700

Three-phase current at 21,500 volts was supplied by the Societa Anonima Elettricita Alta Italia, and this was stepped down by special transformers to 75, 100, and 150 volts for the furnaces of 100, 200, and 1,000 horsepower, respectively. The single-phase furnaces of 100 horsepower were shunted on a single-phase circuit. The current supplied by the above-mentioned company to the furnaces amounted to about 350 kilowatts from December to March, and to 800 kilowatts from March to December, while the total power of the furnaces was 2,600 horsepower or 1,910 kilowatts, as may be calculated from the foregoing data. The Turin works of the Stassano Electric Furnace Company manufactured chiefly parts of railway carriages and wagons, and of automobiles. The Stassano Thermo-Electric Furnace Company went into liquidation in 1909, and some of the electric furnaces of the Turin plant have been transferred to the works of the "Elba" Company at Portoferraio and some to the Milan Steel Works.

The Stassano furnace installed at Portoferraio now operates with cold charges, but it is probable that as the company has available liquid pig iron and Bessemer steel, it will soon adopt liquid charging for the production of high-quality steel. The installation at Milan is not yet in operation.

Heroult furnaces are installed in Italy at the works of the Mannesmann Tube Company, formed by the amalgamation of the Mannesmann Tube Works at Dusseldorf and of the Metallurgical Company of Rome. The works are situated at Dalmine in the district of Sabbro, Province of Bergamo. Three-phase current is delivered at the central station at 12,000 volts, where it is transformed to 550 volts. There are two furnaces in which open-hearth steel scrap is melted, and both furnaces are in operation at the present time.

One Girod furnace is in course of construction at the steelworks at Cornigliano Ligure of the Giovanni Ansaldo Company. The furnace is three-phase of 350 kilowatts at fifty cycles, with a capacity of 4 to 5 tons. The material is charged cold, the maximum potential between phases being seventy volts. The furnace will shortly be put into operation, and is intended for the manufacture of special steels only. It can also be operated with liquid charges, in which case the production will be increased by about 40 to 50 per cent.

Electric steel furnaces may be charged either with liquid pig or with steel produced in the converter or open-hearth, and either the acid or basic process may be employed. Where steel from the converter or open-hearth furnace is charged, a simple refining operation alone is required, and the improved quality, and particularly the increased resistance to shock, of the electric steel appears to be due to the much lower percentage of occluded gas in that material as compared with the gas contained in ordinary steel, the commercial composition being the same in both cases.

The first furnace which was operated with liquid charges in Italy was the Kjellin furnace installed at the works of the Giovanni Andrea Gregorini Steel & Iron Foundry Company at Castro on Lake Iseo. At first cold scrap was used, but it is now working on liquid steel taken from a four-ton open-hearth furnace, which supplies to the electric furnace 1,400 kilogrammes of metal of the following composition at each heat:—

Carbon	Silicon	Sulphur
per cent.	per cent.	per cent.
0.08 to 0.10	0.03 to 0.05	0.010 to 0.020
Phosphorus	Manganese	
per cent.	per cent.	
0.008 to 0.015	0.18 to 0.35	

The final product contained:—

Carbon	Silicon	Manganese
per cent.	per cent.	per cent.
0.60	0.25	0.12

The recarburisation was effected by adding pig iron, and since the furnace is tapped every two and one-half hours, yielding at each heat 1,400 kilogrammes of steel, the daily production, figuring in the added pig iron, amounts to about fifteen tons.

The steels produced, whether of a very soft quality or hard, are very malleable notwithstanding when the manganese is quite low. They are even malleable with the following extreme compositions:—

	Per Cent.
Carbon	0.07 to 0.68
Silicon	0.015 to 0.10
Sulphur	0.018 to 0.007
Phosphorus	0.008 to 0.006
Manganese	0.006 to 0.08

The Kjellin furnace of the Gregorini Company is a simple induction furnace taking 300 kilowatts. It is supplied with single-phase current at twenty-five cycles, and has a power-factor of 0.55 when the charge is two tons. When working on cold charges the production is about ten tons daily, the energy consumption in that case being 690 kilowatt-hours per ton of steel produced. The patent furnace lining of the Poldihütte is used, which lasts for about 120 heats, during the first eighty of which exceptionally rapid working is possible. High-speed steel can be manufactured in this furnace containing several per cent of tungsten and of chromium.

PRODUCTION OF PIG IRON IN THE ELECTRIC FURNACE.

In Italy experiments have been carried out by Carcano for the production of pig iron from the residues of the pyrites which abound in that country. The pyrites residues can always be used in the blast furnace but thorough purifying and enrichment, as well as agglomeration by special processes are necessary to prepare them for treatment in the blast furnace. The chemical composition of the natural pyrites residues varies considerably, but what chiefly differentiates it from ordinary iron ore is its high sulphur percentage, often exceeding four per cent.

The pyrites residues treated by Carcano in the electric furnace had the following composition:

	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Silicon	8.0	12.25	9.10	7.9
Iron	56.0	47.0	52.0	60.3
Aluminum	9.30	18.80	12.30	6.9
Sulphur	2.01	2.63	4.25	2.01

The residues were charged in their natural powdery condition, and it was endeavored to work with the most basic slag possible, preferably with a multiple base and with a certain percentage of manganese, so as to ensure that the slag had a sufficiently strong desulphurizing effect. The necessity of highly basic slag has been much discussed when it is desired to obtain a very energetic desulphurizing action, but, generally, manganese is found to have a sufficiently desulphurizing influence. This was also evident in the experiments under consideration, as may be seen from the following chemical determinations made on the raw material and on the pig iron produced under these conditions:

	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Manganese	0.558	0.744	1.28	2.14	2.54
Sulphur	0.146	0.124	0.093	0.048	0.026

The production of pig iron amounted to something under 100 tons, and the

quality of the product may be judged from the following analyses:

Sulphur. Per Cent.	Phosphorus. Per Cent.	Manganese. Per Cent.	Silicon. Per Cent.	
0.046	0.063	2.23	3.83	
0.058	0.075	2.17	4.46	
0.015	0.073	2.26	6.70	
0.026	0.016	2.54	5.70	carbon=1
	Ferro-alloys.			
0.015	0.060	11.25	3.30	
..	0.060	13.66	8.90	

In sample No. 4 of the foregoing series of analyses the carbon amounted to only one per cent, while the manganese and silicon were much higher. The material might be classed as a special kind of steel, rather than as a pig iron. In these trials various types of electric furnace of different powers were used. The first furnace was 180 horsepower, while that tried in 1908, which Carcano found to give the most favorable results, was of a capacity varying from 200 to 300 horsepower. It was a closed furnace with neutral hearth supplied with single-phase or three-phase current with automatic charging, and with recovery of the carbon monoxide evolved during the reactions. That gas was used for the purpose of preventing deoxidation of the pyrites residues. The energy consumption per ton of pig produced averaged 2,100 kilowatt-hours in a furnace of 180 kilowatts and using pyrites residues containing 50 to 55 per cent of iron in the form of ferrous oxide. The lower ends of the vertical electrodes rested on the slag, so that the furnace worked as a surface-resistance furnace and the slag was of very high temperature, much above that of the bath. By this means it was possible to obtain highly fluid slags sufficiently basic in character, which accounts for the ability to desulphurize sufficiently when using materials containing so high a proportion of sulphur.

As regards the economic aspect of the process, data are unforunately lacking regarding electrode consumption, charges for cooling water, refractory material for lining, and labor, to make it possible to present a practical estimate. There is to be taken into account besides, the cost of raw material and of transport, the pyrites, at least in Italy, being generally situated at a considerable distance from the regions where water power is plentiful. On the other hand, the districts abounding in water power are far from the markets for metallurgical products and from the seaports.

FERRO-ALLOYS.

The chief metallurgical products manufactured in the electric furnace in large quantities are ferro-alloys. Some, such as ferro-manganese and ferro-silicon low in silicon, were already known before the introduction of electric smelting, but with the electric furnace it is possible to produce alloys with a carbon content very much lower than that obtainable when smelting these alloys in the blast furnace. The production of alloys such as high grade ferro-silicon, ferro-chromium, ferro-tungsten is only practicable in the electric furnace, and these are manufactured either from the ores of the respective metals or direct from the metals themselves or from the metals and ores together. The only ferro-alloy electrically manufactured in Italy on an important scale is that of ferro-silicon, of which 628 tons were made in 1909.

As already stated, Mr. Carcano has obtained a kind of spiegel and silico-spiegel using pyrites residues. The author of the present paper has made some experiments for the purpose of studying the economic possibility, under certain given conditions, of producing ferro-silicon by smelting, in the electric furnace, silicates of iron or iron ores too highly siliceous for treatment in the blast furnace, also cast or pig iron that has been rejected on account of its high sulphur or phosphorus contents. The electric furnace used for the experiments was one of those specially modified by the author, the special characteristics of which are the absence of any kind of flexible conductor, a minimum quantity of current passing through the conductors and, above all, through the electrodes, a minimum space taken up by the conductors, and confinement of water cooling to those parts of the furnace above the plane of the electric arcs. As a result of careful attention to these details the furnaces, which have also been used, with suitable modifications, for the manufacture of carbide of calcium, have a high thermal and electric efficiency and consequently a high total of efficiency, whatever kind of current is employed. With alternating current, which is now generally used in modern metallurgical works, the power-factor of such furnaces approaches as near as practicable to unity. The current supplied to the furnace is one of 12,000 amperes at forty-two volts twenty-five cycles. The production in round figures was about twenty tons of ferro-silicon of varying silicon percentages.

Ozone in Water-Purification.

The de Frise ozonizing apparatus, which is installed at St. Maur, France, in connection with its water-purifying system, is described in a recent issue of the London *Times*. This ozonizer is notable on account of the absence of a solid dielectric, each cell or unit being formed of a horizontal brass trough, fitted with a plate glass cover and provided with an external water jacket. This trough is grounded and forms one pole of the apparatus. Half disks of brass with serrated edges are suspended from the glass cover at equal distances along the length of the trough, and form the other pole of the apparatus. When connected up to a source of electricity at 2,000 volts, a silent electric discharge occurs between the sharp points of the semi-circular high-tension poles and the inner water-cooled surface of the brass trough. The air circulating through the trough is ozonized as it passes across the four-inch space separating the two poles of the apparatus. The capacity of the St. Maur water-ozoning works is stated to be 6,000,000 gallons a day. The water and ozonized air are brought into contact in vertical iron cylinders, enameled internally, and divided into sections by celluloid sieves. The cost of treatment is stated to lie between 0.9 cent and 1.1 cents per 1,000 gallons.

At Chartres and at Nice, whose installations are also notable, the Otto system is in use, the former works having a capacity of 1,325,000 gallons a day and the latter of 10,000,000 gallons.

The early form of Otto ozonizer was based upon the use of rotating-disk electrodes which were provided with segmental openings, by means of which any sparking that might occur was stopped before it had done much harm. In the latest form, however, glass is employed as a dielectric, and the ozonizer now consists of a series of sheets of glass coated on alternate sides with tinfoil and separated by narrow strips of insulating material which leave an air space between each adjacent sheet of glass.

Electric-Railway Construction Active in Spain.

Great activity is being shown in Spain at present in the building of electric railway lines, both urban and interurban.

Questions and Answers

All readers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN are invited to submit questions and answers to this department. Correspondents are requested to send full name and address. This, however, will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered.

Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question. Answers will be published in a subsequent issue.

QUESTIONS.

No. 19.—AMOUNT OF OZONE NECESSARY FOR VENTILATION.—In a hall having a system of forced ventilation with distributed registers, how much ozone should be generated by an ozonizer placed at the intake, in respect to size of hall and number of people; what should be the capacity of the ozonizer in order to properly ozonize the air? On what facts are these figures based? If the ozonizer is not connected with a fan for circulating the air, what proportion should the ozone generated bear to the amount of bad air to be vitalized? How is the ozone thus generated measured as to strength, amount, etc., for any given length of time?—H. M. G., Indianapolis, Ind.

No. 23.—TROUBLE IN WIRELESS SENDING.—I have just started some work in wireless telegraphy and am having fine results in receiving, but a great deal of trouble in sending. I have a seventy-foot, three-wire aerial. When I connected the coils to the 110-volt lighting circuit in the house, I got a good spark across the spark gap, but as soon as I threw in my aerial and ground it burned up the wire in the electric light fixtures all over the house and a few minutes later blew all the fuses except the ones on the wireless circuit. When this happened I was using a gas-pipe ground. Later I tried a water-pipe ground and then it would not blow the fuses but sparks would jump from the fixture stems and from the broken wires; our fixtures all have insulating joints and are not grounded. I do not understand why I had so much trouble after the aerial and ground were connected and yet got a good spark before. My sending set consists of two Dow spark coils connected in series, sulphuric-acid interrupter, spark gap, condenser and key. Other amateurs in this city are using 110 volts and gas-pipe grounds with fine results, while I have tried various grounds and cannot send out.—J. C. S., Cleveland, Ohio.

No. 25.—ELECTRIC MOTORCYCLE.—Has electricity been used for running a motorcycle? If so, what is the size and weight of the storage battery needed?—M. R. P., Davenport, Iowa.

No. 26.—ELECTROLYTIC RECTIFIER.—Please describe and give sizes of the simplest form of electrolytic rectifier consisting of aluminum and lead plates in ammonium phosphate solution, to be used for charging (at least two at a time) automobile ignition batteries on 10-volt alternating-current circuit.—J. S., Alameda, Cal.

ANSWERS.

No. 10.—ELECTROMAGNET DESIGN.—What is the smallest sectional area of core of an electromagnet which will be sufficient to exercise a force of one pound upon an armature two inches away, and what winding should be used? It is to be connected to a 110-volt circuit and used intermittently.—M. E. R., Baltimore, Md.

The sectional area of core required in a magnet depends upon how much power is available, and usually this is limited so as to bear a reasonable relation to the material used in the coil. In the case cited, however, the air gap is so large that an economical design in a small apparatus seems precluded. I would suggest that your apparatus be arranged to use a plunger type of electromagnet, so that it would be possible to have a motion of two inches without such a long air gap. In that case the design can be worked out as follows:

The pull depends upon the area of plunger, and the ampere-turns per inch of winding. A safe value of the maximum pull is 9 pounds per square inch for 1,000 ampere-turns per inch. Allow 6 pounds for the extreme position. To get one pound pull would require 167 ampere-turns per inch for a plunger of one square inch. The diameter of the plunger would be 1.13 inches. The coil should be five or six inches long. Using No. 20 wire, and assuming a winding space five inches long, 1.5 inches inside diameter and 3.0 inches outside diameter, eighteen layers could be wound, with twenty-five turns per inch. This would give 450 turns per inch, requiring a current of 0.27 ampere. The average length of a turn is seven inches and the total length of wire for 2,250 turns is 1,313 feet. This has a resistance of about 14 ohms, and would take too much current if connected directly to a 110-volt circuit. It should be connected through an eight-candlepower carbon-filament lamp.—I. D. K., Keokuk, Iowa.

No. 22.—FORMULA FOR HARMONICS.—Please give a simple formula for calculating even and odd harmonics and show how they may easily be distinguished and separated.—C. S., Los Angeles, Cal.

The method of calculating the harmonics depends upon what data is available. Assuming that you have a curve already traced, equally spaced ordinates of the curve are measured, and various formulas exist for computing from these the values of the harmonics. The greater the number of harmonics present, and the higher the accuracy desired, the closer should the ordinates be spaced. The presence of even harmonics can be detected from the fact that they give different shapes to the positive and negative lobes of the curve. When any odd harmonics are present, as is usual with electric currents, the positive and negative waves have the same succession of values. Formulas for computing the harmonics are given in an article by Henry Hermann in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for July 17, 1909, but are too lengthy to reproduce here. By addressing the Director, Bureau of Standards, Washington, D. C., you can secure copies of Technical Papers No. 87 and No. 119. The former gives a method of measuring the necessary ordinates without tracing the curve; the latter gives a method of computing two of the odd harmonics directly from instrument readings.—Editor.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

WESTERN UNION TELEGRAPH COMPANY.

From the financial statement of the Western Union Telegraph Company for the year ended June 30, 1911, it appears that the total earnings amounted to $35,478,793, an increase of $2,724,682. However, total net income aggregated only $7,105,357, a decrease of $169,543. This was due to heavy increase in operating expenses, taxes, etc. The surplus after interest was $5,371,968, equal to 5.38 per cent on the $99,817,100 outstanding capital stock, as compared with 5.49 per cent earned on the same stock the previous year. The income account compares as follows:

	1911	1910
Gross teleg. earnings	$34,714,810	$31,788,246
Miscellaneous earnings	763,983	965,865
Total earnings	$35,478,793	$32,754,111
*Expenses and taxes	30,053,631	26,614,303
Net earnings	$ 5,425,161	$ 6,139,808
Other income	1,680,196	1,135,092
Total income	$ 7,105,357	$ 7,274,909
Interest	1,733,389	1,687,830
Surplus	$ 5,371,968	$ 5,587,070
Dividends	2,991,304	2,989,696
Surplus	$ 2,380,663	$ 2,597,374

*Includes rent of leased lines, reconstruction, repairs, etc.

The stockholders have ratified the lease for ninety-nine years of the Anglo-American Telegraph Company and the Direct United States Cable Company. The directors were re-elected at the annual meeting.

President Theodore N. Vail says in part:

"While your company has had a great past, and cannot fail to have as great a future, present conditions, resulting from a long period of unsettled business and labor conditions and of economies and retrenchments, are, from a conservative standpoint, far from satisfactory. Without going into detail, there still exists a necessity for the doing of many things which cannot be ignored. Salaries and wages to be readjusted, an effective and beneficial pension scheme to be inaugurated that good men may not only be retained but encouraged and made to feel that the interest and prosperity of the company works for their interest and prosperity. Offices and apparatus and general surroundings to be improved, brightened up, that all work may be done under decent and sanitary conditions. Plant to be reconstructed, that promptness and efficiency may be required and obtained.

"Considerable has been done in these directions, but much remains to be done, and when done there is no doubt but that the result will be increased economy and efficiency in the work and service, to the direct advantage of both your company and the public. While in law, equity, practice or in the opinion of the most radical thinkers on corporation matters, there is no question of the right of a corporation to recognize in its balance sheet intangible assets which are essential and necessary in its business and to its existence and continuance, or of the right to consider such assets in its financial operations, yet under the conditions already set forth it would be much better to have the reserve for depreciation of your company represented by something more tangible than by such assets.

In order that public confidence may be strengthened not only in the ability of your company to continue any dividend disbursement which may be established in the future, but also confidence in its possibility to restore your company to a reasonable dividend-paying basis, it is proposed to carry to depreciation reserve all earnings over and above the present dividend, to charge such construction to that reserve as the directors may deem expedient, and to continue this procedure until such a time as the fund would in the opinion of your directors admit of an increase in your dividend rate."

AMERICAN TELEPHONE & TELEGRAPH COMPANY.

For the nine months ended September 30, the American Telephone & Telegraph Company reports earnings in comparison with the corresponding periods of the previous year, as follows:

Earnings—	1911.	1910.
Dividends	$15,438,090	$14,115,398
Interest and other revenue	7,777,934	8,311,128
Telephone traffic (net)	3,588,289	3,602,965
Real estate	69,982	73,045
Other sources	423,697	207,973
Total	$27,297,994	$26,310,511
Expenses	2,673,204	2,578,901
Net earnings	$24,624,789	$23,731,609
Deduct interest	4,207,423	3,836,296
Balance	$20,417,366	$19,895,313
Dividends paid	16,285,908	15,549,388
Balance	$ 4,131,457	$ 4,345,925

For the eight months ended August 31, the earnings of the Bell Telephone System in United States, including the American Telephone & Telegraph Company and associated holding and operating companies in the United States, but not including connected independent or sub-licensee companies, were as below. All duplications, including interest, dividends and other payments to the American Telephone & Telegraph Company by associated holding and operating companies, are excluded.

	1911.	1910.
Gross earnings	$117,507,844	$108,095,987
Expenses—		
Operation	$ 39,661,080	$ 35,143,990
Current maintenance	19,795,138	16,940,491
Depreciation	18,090,175	18,085,335
Taxes	6,017,946	5,338,259
Total expenses	$ 83,564,339	$ 75,508,075
Net earnings	$ 33,943,505	$ 32,587,912
Deduct interest	9,129,950	7,560,171
Balance net profits	$ 24,813,555	$ 25,027,741
*Dividends	16,965,240	16,841,531
Surplus earnings	$ 7,848,315	$ 8,186,210

* Paid for six months and estimated for two months.

PHILADELPHIA ELECTRIC.

The report of the Philadelphia Company for the month of August, 1911, compares as follows:

	1911	1910
August gross	$1,493,155	$1,559,234
Expenses and taxes	1,038,372	979,773
August net	454,783	579,461
Other income	338,829	300,800
Total income	793,612	880,261
Charges	594,004	580,501
August surplus	199,607	299,760

OREGON ELECTRIC RAILWAY.

The Oregon Electric Railway Company reports for the year ended June 30, 1911, compared as follows:

	1911	1910
Total operating revenue	$616,079	$474,867
Total operating expenses	323,512	274,120
Net operating revenue	292,567	200,747
Taxes	30,403	11,450
Operating income	262,164	189,297
Other income	5,239	1,942
Total income	267,404	191,239
Interest on bonds	100,000	100,000
Surplus	167,404	91,239

EDISON ELECTRIC OF BOSTON.

The report of the Edison Electric Illuminating Company of Boston for the month of September and three months ended September 30, compares as follows:

	1911	1910
September gross	$ 426,984	$ 371,948
Expenses	185,777	170,943
September net	241,207	201,005
Three months gross	1,162,499	1,039,938
Expenses	538,483	495,788
Three months net	624,016	535,150

METROPOLITAN WEST SIDE ELEVATED.

The Metropolitan West Side Elevated Railroad Company reports for the year ended June 30, 1911, compared as follows:

	1911.	1910.
Gross	$3,180,327	$2,991,368
Expenses	2,773,964	2,567,145
Net	406,363	424,223

The surplus for the year ended June 30, 1911, after deducting charges, depreciation, dividends, etc., was $145,126.

SOUTH SIDE ELEVATED.

The report of the South Side Elevated Railroad Company for the year ended June 30, 1911, compares as follows:

	1911.	1910.
Gross	$2,419,922	$2,348,135
Expenses	2,065,169	2,046,250
Net	354,753	301,885

The surplus for the year ended June 30, 1911, after charges, depreciation and dividends was $74,550.

NEW YORK TRACTIONS.

The earnings of the principal New York traction lines for the month of June, as reported to the New York Public Service Commission, follow:

	Total Oper. Revenue.	Oper. Income.	Other Income.	Total Income.
Hud. & Man.	$ 237,920	$129,882	$83,485	$213,367
Interboro:				
Subw. div.	1,109,295	552,835	27,432	580,267
Elev. div.	1,253,783	578,408	2,649	581,057
B. R. T. Syst.	2,045,384	764,959	44,450	809,409
†Metrop. St.	1,169,282	301,707	12,235	313,943
Cent. Park.	57,747	*4,927	42	*4,885
†Second Ave.	86,283	19,864	3,170	23,034
†Third Ave.	321,828	144,317	992	145,309
†Dry Dock	50,923	64	846	910
†42d St., M.	142,890	47,255	3,636	50,891
N. Y. Cy. Int.	26,013	6,401	.....	6,401
†Union	282,125	105,243	132	105,375
†Westchester	57,175	10,373	285	10,658
†Yonkers R.	65,951	*28,927	482	*28,445
N. Y. & Q.Co.	118,955	27,156	284	27,440
Coney I. & B.	154,489	30,547	4,088	34,635

*Deficit. †Operated by receivers.

Total operating revenue of all New York tractions for June was $7,324,896; operating income, $2,695,852; other income, $199,160; total income, $2,895,013.

New Electrical and Mechanical Apparatus and Appliances

A New Electric Cigar Lighter.

Many interesting characteristics are displayed by the heating element used in the Helion cigar lighter now being placed on the market. It is said to have many hundred times the resistance of platinum or of nickel-chromium alloys. Consequently a large resistance can be concentrated in a small space.

It is capable of withstanding the enormous temperature of 1,700 degrees centigrade without change in its physical, chemical or electrical characteristics. All danger of short-circuiting due to its becoming plastic or losing its shape is eliminated.

When connected to the proper voltage this material will maintain its temperature and hold its character practically indefinitely. On account of the small amount of material it comes up to temperature very quickly. This material heats in the open air and requires no insulation of any kind. Also cigar ashes or any other foreign substance may come into contact with it without having any effect upon it whatever. Also it is not affected by moisture or by drafts of cold air.

HELION CIGAR LIGHTERS.

These cigar lighters are made for either alternating-current or direct-current circuits and for two voltage classifications—100 to 110 and 110 to 120. They are manufactured by the Pittsburgh Electric Specialties Company, 927 French Street, Pittsburgh, Pa.

Miniature Illuminated Letters.

One of the most interesting electrical novelties for window-display purposes is the miniature illuminated letters, shown in the accompanying illustrations, which are being manufactured by the Chicago Miniature Lamp Works, Chicago, Ill.

Each letter is a separate unit, being one complete incandescent lamp with several carbon filaments. These letters are three inches in height and are so constructed that they may be joined into different words at will. They are made from a glass tube one-half inch in diameter and are backed up with white porcelain. The letters are mounted on individual metal bases through which the connection with the circuit is secured. The filaments in each lamp are in series and are spaced uniformly. The resistance in the smaller letters is regulated by the length of the filament. The current consumption of each letter is rated at eleven watts.

MINIATURE LETTER.

It is said that there are almost unlimited possibilities in the use of this novelty. The lamps may be frosted or colored to suit the requirements of the occasion. Scrolls, designs or monograms may also be made up from this tubing, offering a large field for original displays in the show window. While the current consumption of the letters is small a further reduction can be made by using flashers, the wiring being such as to permit of their use.

One of the accompanying illustrations shows a portion of one of the miniature signs placed in the show window of a Chicago store where it has attracted considerable attention.

New Crane Panels.

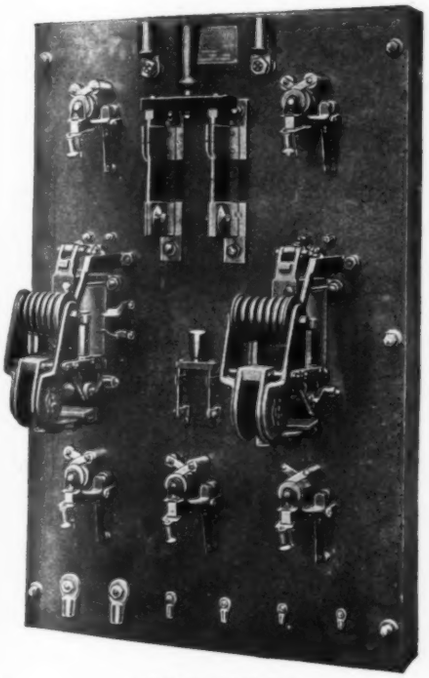
The knife switches, fuses, circuit-breakers, etc., located in the cab of an electric three, four or five-motor crane take up considerable space. The blowing and renewing of cartridge inclosed fuses incurs considerable expense and delay. These conditions have created the need for a crane switchboard panel which will carry all necessary switches, protective devices, etc. A panel of this type manufactured by the Cutler-Hammer Manufacturing Company of Milwaukee designed, in this case, for a three-motor crane, is shown in the accompanying illustration. This panel gives protection against overload, short-circuit and failure of voltage. It reduces the amount of wiring in the crane cab, saves space, makes installation easy, and eliminates the cost and time required in renewing fuses.

ILLUMINATED LETTERS IN WINDOW.

Two single-pole magnetically operated switches, one in each side of the main line, and the overload switches are the principal devices on the panel.

The contactor switches have copper and carbon auxiliary arcing contacts with blowouts and laminated-copper brushes for carrying the current. Two single-pole switches are used because of several advantages over the double-pole type. They provide two chances of opening the circuit on overload, short-circuit, etc. If a double-pole switch should stick the circuit would not be opened whereas if either single-pole switch sticks the other will open the circuit. Also if the overload remains on the line the one switch will be tripped as soon as the other is closed. This prevents quick successive opening and closing or what is known as "telegraphing."

The small knife switch handles the



CRANE PANEL.

control circuit for the above switches and provision is made so that any number of these safety switches can be used (connected in series) installed in various convenient locations so that the operator can, from any of these points, open the feeds to all motors on the crane. This safety feature prevents any accidental starting of the motors when inspection or repairs are being made.

There are two main overload switches and three motor feed overload switches, one for each motor on the crane. These overload switches are of special construction, having a vertical break and a wiping contact. They are accurately calibrated and can be adjusted without the use of an ammeter.

With the main line switch and all safety switches closed the operator throws a reset master (which is provided) to position No. 1, this closes one of the magnetic switches and establishes the feed to the second switch. Throwing the master to position No. 2 closes this magnetic switch.

On grounded circuits two overloads for each motor on the crane are sometimes provided and in some locations inclosing cases are desired. These cases can be provided with means for operating the main knife switch without opening the case.

Electric Sterilizer for Instruments.

The psychological effect of sterilizing instruments in the presence of the patient is rapidly becoming recognized by physicians, dentists and hospital attendants, therefore the advantage of having at hand a convenient and ready method of sterilizing is apparent to all.

Instruments may be perfectly clean and disinfected, but the mere fact that the operation of cleaning them is done before the eyes of the patient goes a great ways towards putting them in a more satisfied frame of mind. The sterilizer described below enables this to be done in a very convenient and inexpensive manner.

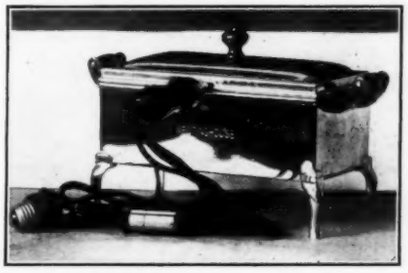
The device consists essentially of the vessel for the instruments and the separable heater element with its attachment plug, cord and switch. The vessel is rectangular in shape, 9 by 4.5 inches, and 3 inches deep, affording sufficient space for the accommodation of a considerable number of instruments at one time. It is built of sheet copper which is nickel-plated on the outside and tinned on the inside. The vessel is supported at the four corners by ornamental metal legs which are riveted and then soldered to the metal of the vessel, a construction that renders it particularly strong, adapting the sterilizer to handling without danger of breakage.

The dimensions of the sterilizer permit the use of instrument trays which are similar to the standard design and can be lifted out by means of the handle of the heating element which is always cool. This construction obviates the inconvenience of using forceps or other instruments for removing the trays, a feature of particular advantage to a person using a sterilizer while engaged in other duties.

The heater element is of the well-known Westinghouse immersion type, and is placed within the instrument vessel containing the water. It is supported a short distance from the bottom by flanges on the sides of the perforated metal tray, thus allowing free circulation of water above and below.

The heater consists of a strip of metal ribbon accurately slotted to secure the proper resistance and assembled under very heavy pressure in a metallic case from which it is effectively insulated. The case is hermetically sealed, thereby excluding all air and preventing any oxidation of the heater or the heating element.

This form of heater is most efficient for the reason that it is wholly surrounded by the water into which all the heat generated must pass directly, effectively preventing any loss due to direct radiation in air and loss due to direct radiation in air and



ELECTRIC STERILIZER.

raising the temperature of the water in the least possible time.

Owing to this method of construction the heater element is said to be practically indestructible and will not be damaged should it be allowed to operate at full voltage in the open air.

Two heats are provided, and the control is obtained through a single telescopic switch placed in the cord. At the maximum input of 500 watts, instruments can be sterilized in ten minutes or less. The minimum input is 125 watts, and is used for maintaining a temperature attained by the use of the higher wattage.

The sterilizer is manufactured and placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa.

Quartz Heating Element.

In the heating element devised in England by Bastian, the resistor consists of a spirally wound wire of the alloy known as nichrome, inclosed in a tube of quartz.

Changing the TTC Tungstolier.

The two accompanying illustrations show in graphic manner the ease with which the new sectional fixture, the TTC Tungstolier, can be taken apart and remodelled. All parts are interchangeable and are ready wired, so that all that is necessary in changing one type of arm for another, for instance, is to loosen a lock nut, pull out the old arm and shove in the new, the electrical connection being made by a spring clip on the arm which engages a suitable receptacle in the fixture body.

This interchangeable feature is of great value to the public, because if a three-light TTC Tungstolier is installed in a living room and a four or five-light fixture is desired it is only necessary to purchase one or two additional fixture arms, and they can be put in actually in less than two minutes, and the fixture need never be taken off the wall. With anything but this new Tungstolier, however, either the fixture would have to be taken down and sent to a factory to be remodelled or an entirely new fixture would have to be purchased.

From the dealer's standpoint, the TTC idea is revolutionary in its opportunities. A stock of eighty-six parts actually enables him to build up and display 1,944 absolutely different types of fixture. These fixtures are received from the manufacturer wrapped in tissue paper and packed in pasteboard cartons, sealed against dirt and moisture, therefore there is no depreciation in stock which is a most important item. At present a dealer's stock is largely hung on the ceiling and depreciates very rapidly. It is hard to store because it is so cumbersome and requires much costly space.

The most important advantage to the dealer, however, is that these fixtures are easier and less expensive to sell. Under the old system it is exceedingly difficult for the purchaser to make a selection. Most fixture display rooms look like an inverted forest, with a large and miscellaneous assortment of fixtures all helping to add to the confusion. The person who attempts to select fixtures for a small dwelling, sees the styles he had in mind close beside some ornate fixture for a public building, and it looks most unattractive by contrast. The result is that double the necessary time is wasted while the customer makes up his mind, simply because the dealer has unconsciously made it so difficult to select a fixture on its own merits. The TTC Tungstolier can be sold in a small reception room, where the parts are kept in convenient cases and the various fixture types can be built up before the prospective purchaser. Only one fixture is on exhibition at a time, and there is nothing to divert the attention. The TTC parts are sufficiently varied to provide appropriate fixtures for the home, the office or the large public building.

In addition to the TTC interchangeable fixtures simplifying the actual selling methods there are several other advantages of equal or greater importance that should be considered. First a fixture dealer does not have to carry a large stock. All additional parts that go to make up the 1,944 designs are carried in stock ready for immediate shipment by the manufacturer. Secondly, it is not necessary to run risks of loss through changes of style and deterioration and third, having a small display room, a $120 investment will provide a complete stock of parts. The Tungstolier Company of Conneaut, Ohio, manufactures the new fixture and has published several interesting booklets, which describe the scheme in detail.

SHOWING PARTS OF TUNGSTOLIER.

CHANGING OVER A FIXTURE.

Automatic Telephones in Australia.

The Federal Government of Australia has purchased from a Chicago manufacturer of automatic telephones a complete automatic system to be installed at Geelong, in the state of Victoria. The equipment provides initially for 900 independent lines, 100 lines for private branch exchanges and 100 four-party lines. Further installations of automatic telephone systems are expected in other parts of Australia.

Cactus for Telephone Poles.

A newspaper report is the authority for a statement that Sahuara cactus is to be used by the forestry service, Coronado Forest Reserve, as poles for the telephone line which is to be run from Tucson, Ariz., to the Catalinas. The ground over which the line is to pass is of a hard and stony character and is thickly scattered with the tall, tough cacti. The practicability of this suggestion is, however, questionable.

THE NEW MANUFACTURING PLANT OF THE UNITED STATES LIGHT & HEATING COMPANY.

A NOTABLE ADDITION TO THE ELECTRICAL INDUSTRIES OF NIAGARA FALLS.

Early in the year 1909 a consolidation was effected of the National Battery Company, the Bliss Electric Car Lighting Company, and the United States Light & Heating Company, of New Jersey. A new corporation, the United States Light & Heating Company, of Maine, was organized to take over these three properties and to concentrate their productive energies in a large, modern and efficient manufacturing plant.

This plant was to be designed to be in every way particularly adapted for the manufacture of the company's products, which are now confined to axle electric car-lighting equipments of the Bliss and Moskowitz types and storage batteries of the National type for all purposes for which secondary batteries are used. This idea of adaptability was carried out in all the steps connected with the construction of the plant from the selection of a site to the opening of the factory building last winter to the 600 regular employees.

After careful consideration Niagara Falls, N. Y., was chosen as the site for the new plant. A tract of twenty-one acres was acquired near the northern limits of the city. Connected with this land are spur tracks from the New York Central Lines and other railroads; adjoining the premises is a 12,000-volt distributing line of one of the Niagara power companies. Thus excellent shipping facilities and cheap electrical energy are at hand and, when combined with many other industrial advantages, give the plant an almost ideal location.

In designing the plant much study was given to every detail of the manufacturing processes and in accordance therewith the layout of the buildings was arranged to provide a systematic progress of the products through each department with a minimum of handling from the raw materials to the shipping room. To facilitate what handling is necessary, a narrow-gauge industrial railway connects the various buildings. The plant now comprises thirteen buildings that cover a ground area of seven acres, or one-third that in the tract. The buildings are for the most part of substantial mill construction with an abundance of windows, giving excellent natural light and ventilation. Supplementing the latter is a complete system of forced ventilation. All machinery is electrically driven and the use of oil for furnaces has entirely eliminated the need for coal; the plant is therefore exceptionally clean and free from smoke.

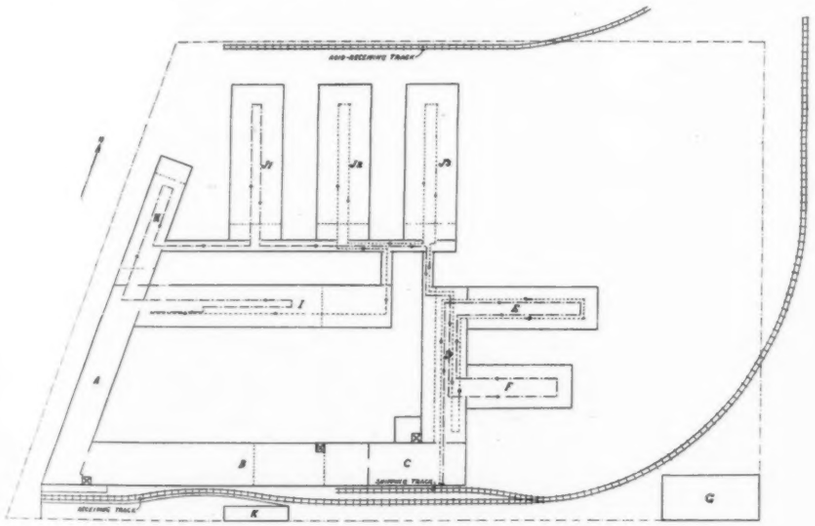


FIG. 1.—PLAT OF BUILDINGS, NEW FACTORY AT NIAGARA FALLS.

The general layout of the plant is shown in Fig. 1. In the five buildings forming the quadrangle are carried on those operations requiring the largest number of employees. Four of the other buildings are devoted to the electrochemical processes of storage-battery manufacture. By far the greater portion of the entire plant is given over to the storage-battery department.

On the second floor of building A, which is the nearest one to Eleventh Street, are located the general offices of the company. On the west side of the hallway are separate rooms for the executive officers and on the east side are large rooms for the accounting and drafting departments. By means of an intercommunicating telephone system all these offices are connected with each other and with the offices of the various foremen scattered through the different buildings.

The first floor of building A is arranged as a store room for raw materials and general supplies. These come chiefly by railroad and are taken directly from the receiving track to the store room. This becomes, therefore, the point of origin of the actual manufacturing processes in both the axle-device and storage-battery departments. The general progress of the work through the former department will be considered first.

AXLE-DEVICE DEPARTMENT.

All but the top (third) floor of building B is devoted to the axle-device department. Here are made the axle-driven generators, the regulators for the generators and lamps, relays, switches and other auxiliaries; these are all assembled and tested. In the machine shop (Fig. 2) at the west end of the first floor is a large array of electrically driven tools for doing all the heavier machine work on the generators and the regulating equipment. The armature core disks and the pole laminations are punched and assembled. In the room directly above, the armature coils are form wound, the commutators built up, and the entire armature assembled. The field coils and regulator coils are also wound here. The various small parts of the regulators are made in an adjoining room (Fig. 3). All the regulating apparatus, including its panel, is then put together. The inspection and final assembly of the generator parts and of the entire axle device occurs in the middle section of the first floor.

In the adjoining room each complete equipment is given a thorough test before shipment. By means of variable-speed motors each generator is run from standstill to a speed corresponding to a train velocity of ninety miles per hour. These tests are made with a storage-battery auxiliary and are a practical reproduction of service conditions; during their progress all necessary adjustments of the regulators are carefully made. Each generator is

tested for four hours, the lamp regulators are tested for an hour at various loads, each complete regulating panel is tested for an hour. Facilities are provided for making prolonged tests on four equipments at the same time; twenty-five complete equipments may be tested in a ten-hour day. After another inspection, the apparatus is taken to building C for crating and shipment via the shipping track.

teries are made by the United States Light & Heating Company. For most stationary service and car lighting Planté type, or electrochemically formed, batteries are made; for electric vehicle or ignition purposes Faure type, or "pasted," batteries are manufactured. Since entirely different processes are employed for the two types of batteries, these are kept quite distinct in their progress through the various

building is a rolling mill through which the pure lead ingots are passed several times and rolled into large sheets of the proper thickness. These are taken to a shear that cuts them into long slabs which are then punched by a machine to the proper shape and size of the desired plates. The blank plates at this time receive their most important mechanical treatment. By means of considerable pressure gradually ap-

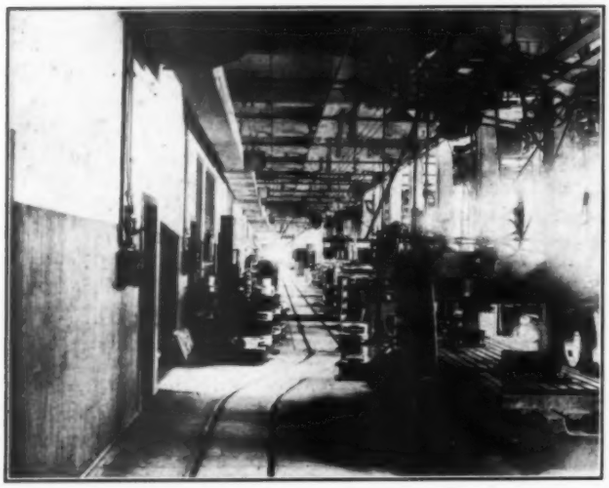


FIG. 2.—MACHINE SHOP, FIRST FLOOR OF BUILDING B.

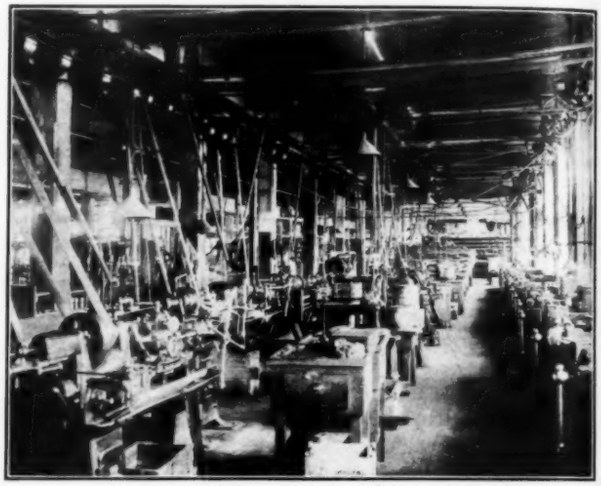


FIG. 3.—REGULATOR WORKSHOP, SECOND FLOOR OF BUILDING B.

FIG. 4.—FOUNDRY FOR FAURE BATTERY GRIDS, BUILDING I.

FIG. 5.—PASTING ROOM FOR FAURE PLATES, BUILDING H.

At the southwest corner of the second floor where buildings A and B join, is located an experimental laboratory for conducting researches and investigations aiming to continually improve the axle equipment in all its details. This laboratory is well equipped with a variety of circuits, electrical instruments, miscellaneous apparatus and tools. Here is also located a complete demonstration equipment.

STORAGE-BATTERY DEPARTMENT.

Two types of National storage bat-

buildings of the battery department. The method of routing the two types through the plant is clearly shown in Fig. 1 by a dotted line for the Planté batteries and by a dot-and-dash line for the Faure type.

For both types the work begins in building I and the initial process is to melt the pig lead received into 800-pound ingots. At this point the differentiation begins. The development of the Planté batteries will be followed first. In the southwest part of the

plied normal to the surface of the blank in a special machine, this surface is provided with parallel grooves separated by intervening laminae pressed up above the original surface. This treatment makes the laminae symmetrical, very homogeneous and of greater density than the body of the plate. The plates are then ready for electrochemical formation.

For this purpose they are taken to building J2, placed between "dummy" plates in specially adapted acid-proof

tanks, electrically connected to a circuit and given a suitable electrochemical treatment, which converts a certain depth of the entire surface of the plate into active material. In order to guard against the retention of any traces of the forming agents in the pores of the plates, the latter are taken to building J3 and given a secondary formation, which leaves all the active material in the form of pure sponge lead. All the plates receive this treatment, those intended for positives as well as the negatives. The negatives are now ready for assembling, but the positives receive a reversal charge, or finishing process, which converts their active material into peroxide of lead.

From each batch of plates that have passed through the forming rooms a certain number are taken at random and removed to the testing department in building D to determine the plate capacity. This serves as a check to ensure that all plates are up to the standard. Aside from this, every plate receives a careful inspection to eliminate any plates having mechanical defects or weakness. Those plates that have been passed by the inspector are then assembled into positive and negative groups. The connecting straps are burned to each group by a special process which is much more rapid than lead burning and more effective. When the element is complete with its separators between plates, another inspection is made. It is then placed in its jar or tank and the whole taken to the adjoining building E.

In this building the electrolyte is added to each cell and the latter connected to a circuit which provides a proper developing charge. Each battery of cells is given a normal discharge to make sure that the rated capacity is easily attained and that no abnormal cell is in the lot. The electrolyte density is standardized and the battery then returned to building D, where in the south end the covers are fitted to the jars or tanks, terminal connections made and the finishing touches given to each cell.

In building C the batteries are crated and shipped. The manner of shipment depends on the size and kind of battery and on the wish of the purchaser. All ignition batteries, most of the car-lighting batteries and many vehicle batteries are shipped complete with electrolyte in their jars or tanks and ready for service. Foreign shipments usually are made with elements assembled in groups but dry, the electrolyte being sent in separate carboys; this is also true of most stationary and many vehicle batteries. Large stationary batteries and special orders of vehicle and other batteries are sent nonassembled, the separate plates, separators, tanks, jars, etc., being shipped in

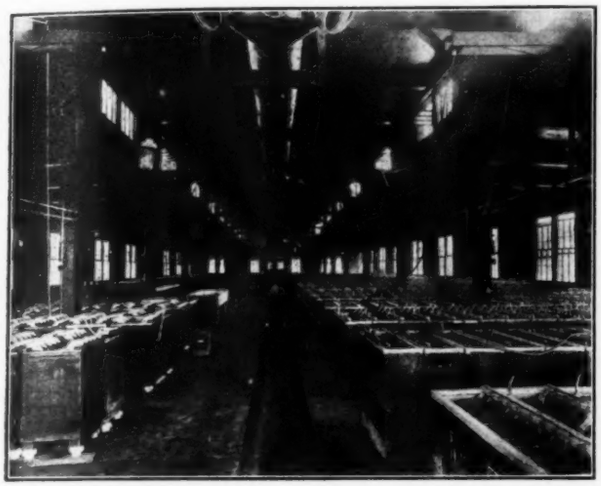


FIG. 6.—ONE OF THE FORMING ROOMS, BUILDING J3.

FIG. 7.—CHEMICAL LABORATORY, SECOND FLOOR OF BUILDING D.

FIG. 8.—CURRENT-CONVERTING SUBSTATION, OR "POWER HOUSE," BUILDING G.

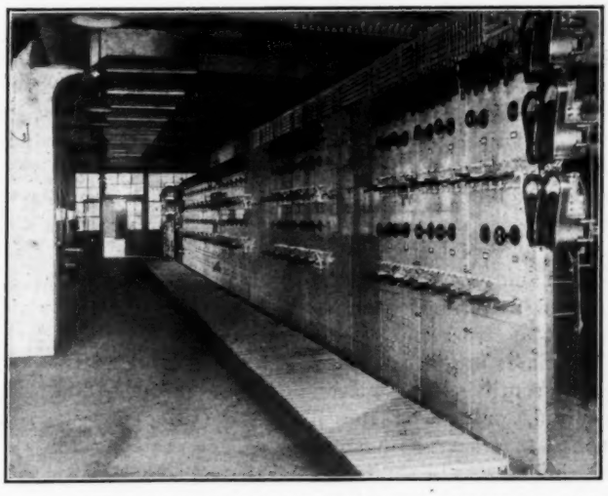


FIG. 9.—LIGHT, POWER AND BATTERY SWITCHBOARDS, SECOND FLOOR OF BUILDING D.

boxes and assembled at their places of destination.

For the Faure type storage batteries the first distinctive process is that in the "foundry," Fig. 4, in the northern part of building I, where grids of antimonious lead are cast under pressure in special casting machines. Here also are cast the connecting straps for joining the plates, as well as cell terminals and bolt connectors of various shapes and sizes, the connectors being all incased in lead. After trimming off the gates, the grids are taken to the pasting department in building H, Fig. 5. Pure oxides of lead form the body of the paste and special care is taken in its application to the grids. After careful drying, the pasted plates are removed to building J1 for forming.

This building, like the two adjoining forming buildings and building E already referred to, is arranged as shown in Fig. 6. Each has a well drained vitrified-brick floor to permit of thorough flushing. All iron work is protected by several coats of acid-proof paint. All wiring is in lead-covered cables. These four buildings have an exceptionally large amount of window and ventilator surface and are also provided with an additional forced ventilating system. On account of the large amount of acid used, a special acid-receiving track was built along the three forming buildings. Special facilities are provided for properly mixing forming solutions and standard electrolyte.

The Faure plates require only a single forming process, which is, however, watched and tested just as carefully as that of the Planté plates. The finished plates are inspected and stocked in the south half of building F. As required, groups of the plates are burned together on the other side of this building. In building D these groups are then assembled with their separators into complete elements. After being placed in their jars, the cells are taken to building E to receive their electrolyte and development charge. They are then again returned to building D for final assembly; covers are sealed on the jars, the cells assembled into their trays or boxes, and connections made between cells and to the terminals on each tray. Shipment follows in building C, as already referred to.

On the third floor of building B is located the wood-working shop of the battery department. Here wood separators are grooved and cut; boxes for ignition and portable batteries, trays for vehicle batteries, and lead-lined tanks for car-lighting and stationary batteries are made of hard wood and thoroughly impregnated with a combination acid-proof filler and paint. All tanks are tested to guard against leakage before use.

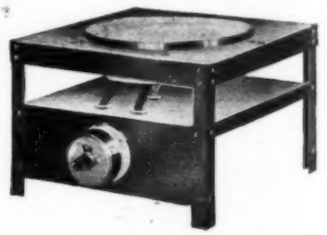
Some reference has already been made to the frequent tests of plates and cells during the battery manufacture. These are conducted for both the Planté and Faure types of batteries. The battery test room occupies the south half of the second floor of building D. The tests include not only the regular capacity and life tests, but a variety of comparison, breakdown and other special tests, as well as investigation aiming to improve the formation and other details of the battery-making processes.

Adjoining the battery test room in the northeast part of the same floor is the chemical laboratory (Fig. 7). All the raw materials used in battery manufacture, including principally lead, lead oxides and sulphuric acid, as well as the iron and steel used in the axle devices, are purchased only on analytical tests of their purity.

ELECTRICAL SUPPLY.

All the electrical energy used in the new factory is purchased from the Cliff Electrical Distributing Company, which controls the Schoelkopf hydro-electric plants. Two three-phase, twenty-five-cycle, 12,000-volt supply circuits enter the substation, building G, an interior view of which is shown in Fig. 8. Each circuit has its own lightning-arrester equipment, oil switches and bank of three single-phase step-down transformers. Connected to each bank is a 750-kilowatt split-pole rotary converter which changes all the current to 250-volt direct current. This was found desirable because the bulk of the energy used in the plant is for the battery department, which, of course, requires it in the form of direct current. The battery, power and lighting mains pass overhead to the distributing switchboards located opposite the chemical laboratory in building D.

A view of these boards is shown in Fig. 9. The board at the left controls the 230-115-volt, three-wire lighting feeders for all the buildings and the 230-volt motor feeders in the buildings constituting the quadrangle. The board at the right controls all the individual battery circuits in the four forming and charging buildings. The operator in charge of this board is in close communication with the men in these buildings and regulates the circuits for them and keeps a record of all the forming and charging done. In this way practically all the delicate electrical apparatus is removed from the acid-laden atmosphere of these rooms, only a few portable voltmeters being required therein. The battery circuits are arranged so they may be operated on either the three-wire or two-wire system. It is customary, however, to operate on the latter plan by cutting out the neutral and thus obviating the need of balancing the system. For the regular battery circuits regulation is secured by means of ingeniously constructed water rheostats that are located back of the large board shown in Fig. 9. For the special circuits of the battery test room 115 volts is generally used in connection with iron-wire rheostats.



ELECTRIC HOT PLATE.

New Electric Hot Plate.

The new eight-inch disk stove now being placed on the market by the General Electric Company is designed for use in readily increasing the capacity of the kitchen equipment of hotels and restaurants, and also for use in carpenter shops, binderies and other manufacturing establishments requiring a high-power rapid-heating hot plate free from the inherent dangers of gas plates.

The stove is provided with a heating element of calorite, and a three-heat indicating switch serves to give 375, 750 and 1,500 watts heat dissipation on 95-128 volts, or 300, 600 and 1,200 watts on 200-250 volts.

Platinum to the value of $260,633 was exported from United States of Colombia in 1910.

Current Electrical News

COMMISSION NEWS FROM NEW YORK.

(Special Correspondence.)

A hearing was given by the Public Service Commission, Second District, upon the appeal of the Westchester Lighting Company from the requirements of the Commission governing the practice of gas and electric corporations in the treatment of consumers' deposits.

On Wednesday at Albany the Commission heard the complaint of the South End Business Men's and Taxpayers' Association of Albany and certain residents of Rensselaer against the United Traction Company as to service in the south end of the city of Albany. On Thursday the Commission took up the complaint of Mayor Mann of Troy against the United Traction Company as to the schedule of cars on the Oakwood Avenue line in the city of Troy. Complaint made by the trustees of the village of Silver Creek against the Buffalo & Lake Erie Traction Company as to service in the village, was also heard.

The Commission has closed upon its records the complaint of the residents of the village of Warwick, Orange County, against the Warwick Valley Light & Power Company as to service and rates. As a result of negotiations conducted by the Commission, a new schedule of rates acceptable to complainants has been adopted by the company, effective October 1, 1911.

INTERSTATE COMMERCE COMMISSION NEWS.

(Special Correspondence.)

A complaint has been filed with the Interstate Commerce Commission by the Home Telephone Company, of Clarksville, Tenn., against the Cumberland Telephone & Telegraph Company, American Telephone & Telegraph Company of New York, and the American Telephone & Telegraph Company of Tennessee.

Of these companies the Cumberland Company, a Kentucky corporation, has telephone plants at Nashville, Springfield and elsewhere in Tennessee, Bowling Green, Louisville and other points in Mississippi and Louisiana. The American Telephone & Telegraph Company connects its long distance lines.

In the complaint it is set forth that the telephone companies of the United States are divided into two general groups: (a) those which are directly owned by or controlled by the American Company and its subsidiary, known as "Bell" plants and properties; (b) those not so owned and known as the "Independent" lines.

The Clarksville Company owns and operates a plant with about 500 telephones at Clarksville, also a toll line to Erin and exchanges at Cumberland City, Dover, Bear Springs and other points. From these various lines and other toll lines not named they ask for the establishment of through routes and joint rates, from which they are at present debarred.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

ELECTRIC PUMPING IN NEW MEXICO.—B. E. Kern of Deming, N. M., is planning to install a large power plant, with pumps, motors, etc., for irrigating 32,000 acres of land in the vicinity of Iola, N. M. The project involves the installation of producer-gas generators, gas engines, electric generators, 100 pumps of 1,000 gallons capacity each, 100 motors of twenty-five horsepower each and fifty miles of transmission line. The total estimated cost of the improvement is $260,000. Upon each 320 acres of land in the tract a well will be put down and a pump installed. D.

A NEW HAMPSHIRE POWER SYSTEM.—The Central New Hampshire Power Company, which incorporated with a capital stock of $15,000,000, will eventually have the largest hydroelectric system in New England and the seventh in size in the United States. On the seventeen developments proposed, five are to be located on the Sugar River and its tributaries, this group having an estimated capacity of 42,200 horsepower. On the Contoocook River there will also be five developments, the first in the village of Penacook, the second at Contoocook village, the third at West Hopkinton, the fourth at Long Falls in the town of Henniker, and the fifth at Hillsboro. Their total capacity is estimated at about 34,000 horsepower. Two developments on the Blackwater River will produce 9,700 horsepower with an opportunity to increase this capacity by means of further development at the upper end of the stream. On the Warner River at Davisville in the town of Warner is a development which can be increased to yield 2,500 horsepower, while the rights for approximately 7,000 horsepower have been acquired on the Smith River in the towns of Danbury and Hill. The proposed development on the Mascoma River is in the town of Lebanon, its estimated capacity being 10,000 horsepower.

LIGHTING AND POWER.

(Special Correspondence.)

RANDOM LAKE, WIS.—A 600-light electric light plant is being installed. C.

OVERTON, NEB.—W. H. Hill has been granted a twenty-year electric light franchise here.

FAIRLAND, OKLA.—L. D. Long has ordered machinery and will put in an electric light plant.

MYRTLE CREEK, ORE.—The city is increasing the capacity of its municipal electric lighting plant. A.

BARABOO, WIS.—The Baraboo Gas & Electric Company is planning the reconstruction of its plant.

DEVILS LAKE, N. D.—Business men are agitating the installation of an ornamental street lighting system. C.

AFTON, OKLA.—This city is about to vote on the issuance of $20,000 in electric light and waterworks bonds.

GALENA, ILL.—The Interstate Light & Power Company is planning the installation of boulevard lighting system. C.

FOREST, CAL.—The North Fork mine is making surveys and estimates of cost for the installation of electric power at its property. A.

SEATTLE, WASH.—Roy W. Comegys has applied for a franchise in King County, Wash., for an electric light and power system.

YUMA, ARIZ.—The Yuma Water & Electric Company will build an addition to its electric power plant. Samuel DeCorse is superintendent. A.

ELLENSBURG, WASH.—The city is planning for the installation of an ornamental cluster street-lighting system in the business district. A.

BLACK RIVER FALLS, WIS.—It is estimated that $100,000 will be required to put the power plant, recently damaged by flood, in operation again. C.

CHICO, CAL.—The Department of Agriculture has completed the erection of an electric light and power plant at its introduction station at Chico. A.

WINONA, MINN.—The Winona Railway & Light Company will expend $20,000 in improvements, including a concrete gravity-intake water system. C.

ABERDEEN, WASH.—The Mutual Heat & Light Company has been incorporated with a capital of $50,000 by W. B. Mack, M. V. Snyned and others.

VIRGINIA, MINN.—A vote will be taken November 21 on acquiring the plant of the Virginia Electric Light, Power & Water Company, by the city. C.

MINNEAPOLIS, MINN.—The Center Improvement Association is conducting a campaign to secure $7,025 for the installation of 147 ornamental lights. C.

OTHELLO, WASH.—The Washington Fruit Lands & Irrigation Company is planning to install electric pumping machinery in the Priest Rapids district. A.

DANVILLE, VA.—City officials have decided to build the new electric light plant. The new plant, for which bonds were voted on July 11, will cost $150,000.

NILES, O.—An effort is being made to secure a tungsten street lighting system in this city. The scheme contemplated is similar to that in use in Warren, O.

SAN JOSE, CAL.—The Great Western Power Company has applied for a franchise for a transmission line along the county roads of Santa Clara County.

COLUMBUS JUNCTION, IOWA.—A vote will be taken November 14 on granting a franchise to Miller & Parks to install an electric light and power plant. C.

SACRAMENTO, CAL.—The Great Western Power Company has been granted permission to lay an underground wire system on certain streets of this city.

SACRAMENTO, CAL.—The Pacific Gas & Electric Company has made application for a lighting and power franchise in recently annexed sections of Sacramento. A.

GLENDIVE, MONT.—The Glendive Yeats Light & Power Company, capital $100,000 has been incorporated by George H. Hollecker, Nick Buttleman and others. C.

DORRIS, CAL.—The Siskiyou Electric Power & Light Company has a large force of men engaged on the preliminary work for the extension of its lines to this town.

PRAIRIE CITY, IOWA.—A vote will be taken October 30 on granting a franchise to the Colfax Electric Lighting Company, of Colfax, Iowa, to install an electric light system. C.

RUBY, MONT.—The Madison River Power Company will extend its lines to Virginia City and install a lighting system. A transformer station is to be erected at Laurin. A.

MUSKOGEE, OKLA.—The Peabody Electric Company has been incorporated by F. H. Nebon, A. D. Peabody and W. R. Robinson of Muskogee. The capital stock is $7,500.

BAKERSFIELD, CAL.—The San Joaquin Light & Power Company plans for the construction of a power line from Bakersfield to the Weed Patch district, about seventeen miles. A.

TUCSON, ARIZ.—The Hart Ranch plans for the erection of a central electric power plant for irrigation operation. Dietrich & Goetz, engineers, Tucson, are in charge of this work. A.

NEW LISBON, WIS.—The contract for the construction of an electric light and water works plant has been let to the Central Construction Company, of Oshkosh, Wis., at $17,500. C.

LINCOLN, CAL.—The city is planning to install an electric street-lighting system. A committee, composed of C. E. Finnie, L. E. Brown and Walter Jensen, has been appointed to arrange for the installation. A.

HAZELTON, PA.—It is expected that the first line from the Harwood power plant to Mananoy City, will be completed by December 15. The Harwood Electric Company expects to use the Mahanoy plant as a substation.

STOCKTON, CAL.—The city is planning for the installation of a municipal underground-conduit system in the business district, to be rented to the private companies. An election for this issue will be held November 7. A.

CHENANGO FORKS, N. Y.—Peters Brothers, who own a dam here, have made application for a lighting franchise in Binghamton. The hydroelectric plant which is to furnish power has been contemplated for some time.

EUGENE, ORE.—The City Council plans for the installation of a tungsten series street-lighting system to cost $25,000, bonds for which were recently voted. An ordinance providing for the sale of such bonds has been passed. A.

PLAINVILLE, MASS.—At a recent town meeting a franchise was granted to the Foxboro Electric Light Company. This company will furnish current for street lights, which it is expected will be ready about December 15.

ZIMAPAN, HIDALGO, MEX.—Andrew Mackenzie, Mexico City, has made application for a concession for the erection of a hydroelectric power plant in the Zimapan mining district, using waters from the Tula and Montezuma Rivers. A.

BERKELEY, CAL.—The Sierra & San Francisco Power Company is planning for the installation of a power and lighting system at Berkeley. No franchise is required for this work, and the City Council has been notified of the intentions. A.

SHOSHONE, WYO.—The first transmission line of the Big Horn Power Company, which will generate 40,000 horsepower from the flow of the Big Horn River at Boysen, has been completed to this place, and the town will be lighted from the company's plant.

GIBSON CITY, ILL.—The plant of the Central Electric Light, Heat & Power Company was recently put in operation and is supplying power to the town. A special opening was held for the purpose of arousing public interest and exhibiting electrical devices.

DOUGLAS, ARIZ.—The Douglas Improvement Company has under consideration the enlargement of its electric power plant here and the construction of a transmission line through the valley with a view of furnishing power for operating wells for irrigating the land. D.

NEW ULM, MINN.—Earle D. Jackson, engineer, St. Paul, recommends the installation of an additional engine and dynamo at the electric light and water plant, estimated to cost $3,800, instead of the construction of a condenser and cooling tower at an estimated cost of $11,000. C.

TULARE, CAL.—The Tulare County Power Company has awarded a contract to Hunt, Mirk & Company, San Francisco, for the installation of a 3,000-horsepower steam-turbine generating plant at Tulare. Construction work on a distributing system will soon commence. A.

GUADALAJARA, MEX.—The Chapala Hydroelectric & Irrigation Company will soon complete the installation of its new hydroelectric plant at Puente Grande and will remodel and reconstruct its power transmission system that extends to the Hostotipaquillo and Etzatlan mining districts. D.

PRAIRIE CITY, ILL.—Permission has been granted to the Abingdon Light & Power Company to enter this town and furnish power for street and residence lighting. St. Augustine will also be lighted by the Abington Company, and it is expected that current will be available January 1.

HOLLAND, MICH.—A recent report of the municipal light plant shows a net income for the fiscal year of $20,610,90, despite the fact that a very low rate is charged for power. The plant has been in operation seventeen years and its total cost is $193,094.41. The total earnings during that time reached $464,682.89.

KALAMAZOO, MICH.—Municipal improvements to cost nearly $250,000, which include a new city hall, modern street lighting system, newly equipped police station, signal service and similar departures, are planned for Kalamazoo, following a junket by city officials to South Bend and other cities of northern Indiana.

DECATUR, IND.—The Holland-St. Louis Sugar Company has contracted to build and equip a large beet sugar plant in this city to cost $1,000,000. The plant will be equipped with electrical machinery and apparatus for light and power. L. G. Ellingham, secretary of state, is largely interested in the construction of the proposed plant. S.

LA CROSSE, WIS.—Bondholders of the La Crosse Water Power Company will start to rebuild the wrecked portions of the Hatfield and upper dams at once, according to word received here. W. J. Ferris, president of the company, will take full charge of the reconstruction work. It is estimated the repairs will cost about $100,000.

STOCKTON, CAL.—The Sierra & San Francisco Power Company plans for the installation of a distributing system at Stockton, with underground conduits in the business section. An auxiliary steam generating plant will be erected to serve the city. The company has commenced construction on a transmission line from Manteca to Stockton. A.

HELENA, MONT.—The United Missouri River Power Company, which owns Canyon Ferry, Hauser Lake and the uncompleted Holter hydroelectric plants on the Missouri River, has gone into the hands of a receiver on request of the United States Mortgage & Trust Company of New York, which holds a bond of $12,500,000 of the company's.

COTULLA, TEX.—J. R. Black, of Cotulla, will construct a dam across the Nueces River to form a storage reservoir for irrigating 12,000 acres of land. The dam will cost about $25,000. In connection with this project there will be installed a hydroelectric plant and cotton mill. The power generated by the electric plant will be transmitted to Cotulla and other towns in this section. D.

GALENA, IOWA.—Work on the erection of the new addition for the Interstate Light & Power Company in this city is being hurried and the new company expects to have the plant in operation within a short time. The capacity of the plant will be doubled and it is planned that in the development of the system several of the smaller cities in Illinois and Wisconsin can be supplied with current.

PORTERVILLE, CAL.—C. H. Holley, chief engineer of the Tulare County Power Company, is quoted as saying that the company will be delivering power to the patrons of the line not later than April 1, 1912. The substation for the orange district will be located at Strathmore, and a site has been secured in Tulare for a station which will supply the dairy district and where a steam auxiliary will be located.

DULUTH, MINN.—Specifications have been prepared by Oscar Claussen, of St. Paul, and Charles Pillsbury, of Minneapolis, engineers, for the installation of a municipal electric light plant, estimated to cost $901,798; including building and machinery, $240,000; overhead wiring equipment, $272,885; underground wiring equipment, $85,700; customers' meters, $72,000. An emergency plant to secure power from the Great Northern Power Company is also planned. C.

BOISE, IDA.—The Boise & Interurban Railway Company has been acquired by the Kuhn interests of Pittsburg, Pa., for a consideration stated to be $5,000,000. This company has also purchased the Swan Falls Power Company, and plans for extensive power development. A large hydroelectric power plant is planned on the Snake River, with transmission and distributing lines throughout this entire district. J. S. Kuhn is head of this corporation. A.

ANDERSON, IND.—The Indiana Service Company has incorporated to carry on the business of supplying water, light, heat and power to the town of Batesville and the cities of Shelbyville, Greensburg, Connersville, Rushvile, Greenfield, New Castle, Anderson, Elwood, Tipton and Noblesville, and to the inhabitants thereof and of other towns and cities. The initial capital stock is $10,000. C. W. Hooven, H. L. Olds, C. A. Wilson and H. D. Hughes are directors. S.

WACO, TEX.—The City Commission will cancel the issue of $250,000 of bonds that were voted by the tax payers of Waco some time ago for the purpose of installing an electric light and power plant. This action is taken for the reason that the Commission has entered into a ten-year contract with the Waco Gas & Electric Company for supplying the city with lights. Under the new contract a reduction of about twenty-five per cent is granted to the city and private citizens. D.

ASHLAND, KY.—The Appalachian Power Company has recorded a trust deed on all of its properties in the sum of $25,000,000. The company is capitalized at $25,000,000 and has recently purchased in this section some very valuable electric light and power plants, in addition to securing rights of way and franchises which permit it to erect a system of dams to furnish hydroelectric power for coal plants, villages, cities and manufacturing enterprises in Virginia and West Virginia.

ELECTRIC RAILWAYS.

(Special Correspondence.)

DAVENPORT, IOWA.—The work of laying rails on the Davenport and Muscatine interurban line will be commenced at once. C.

STOCKTON, CAL.—The survey for the route of the Central California Traction Company's line at Campton to Lockford has been completed.

SEATTLE, WASH.—The Highland Park & Lake Burien Railway Company has been incorporated to build an electric line to Lake Burien and Tacoma. C.

SAN BERNARDINO, CAL.—The Redlands University Railroad Company has been incorporated by G. S. Turrell, F. A. Moore and J. W. Curtis with a capital stock of $15,000.

OMAHA, NEB.—C. W. Baker announces that the Nebraska Transportation Company is ready to start on the construction of an electric railway to Norfolk and Sioux City. C.

STOCKTON, CAL.—The Tidewater & Southern Railway has commenced construction on its electric line between Stockton and Turlock, via Modesto. B. A. Bearse is manager. A.

OGDEN, UTAH.—The Ogden, Logan & Preston Railway plans for the construction of an electric line from Ogden to Preston, via the Cache Valley. A franchise has been granted. A.

MINNEAPOLIS, MINN.—The Electric Short Line let the contract to George Turnham & Company for grading three miles of road beyond Medicine Lake. W. L. Luce is president. C.

WAYCROSS, GA.—Plans are being made for a bigger and better trolley system than was at first proposed. About $250,000 will be spent on the system which is now being considered.

POCAHONTAS, IOWA.—It is reported that the Rock Island Railway Company has a controlling interest in the Fort Dodge, Des Moines & Southern interurban line and improvements will be installed this fall. C.

DECATUR, IND.—Substantial subsidies have been voted by the citizens of Monroe and Wabash townships in aid of the construction of the extension of the Ft. Wayne and Springfield line from Geneva to Portland. S.

LANSING, MICH.—The State Railroad Commission has authorized the Michigan & Indiana Traction Company to incorporate for $750,000 for the purpose of constructing a road from Coldwater to Battle Creek, via Union City and Athens.

SAN DIEGO, CAL.—Extensive improvements are to be made to the lines of the San Diego Electric Railway Company. Present single-track lines will be double tracked and several extensions made. Pay-as-you-enter cars will be put in service.

SACRAMENTO, CAL.—President T. T. O'Gregory, of the Sacramento-Woodland Railroad, has awarded a contract to the Dozier Construction Company for the construction work of the line between Woodland and Elkhorn, and to Cooper & Hawley for the construction of another section.

ASHLAND, WIS.—Ashland capital is back of a new interurban electric line to connect the cities of Bessemer and Ironwood, Mich. Service will be instituted prior to January 1. It will connect at Ironwood with the interstate electric line serving that city and Hurley, Wis. A waterpower plant is also being developed at Saxon.

GARY, IND.—The Board of Public Works has granted a fifty-year franchise to the Indianapolis, Chicago & Meridian Railway of which John A. Shaffer of Indianapolis is president. The company gets rights through seventeen streets, a cross-city route seven miles long. It is announced that the Gary-Valparaiso division will be started at once. S.

MADISON, WIS.—A subscription of $40,000 is being made by property owners on the country shore of Lake Montona as a bonus for the building of an electric line around the lake as an extension of the line of the Chicago & Wisconsin Valley Street Railway Company. This company, which is capitalized at $10,000, following a reorganization, is now constructing a system in this city to connect with a line to run from Portage.

SAN LUIS POTOSI, MEX.—It is reported that the English interests that recently purchased the street car system here which is operated under the name of San Luis Tramways Company will soon begin the work of transforming it into electric traction. The same interests are negotiating for the purchase of a local street railway system in Tampico and if the deal is consummated they will convert that system into an electric one. D.

KANSAS CITY, MO.—More than a mile of the grade for the new electric line of the Kansas City & Excelsior Springs Electric Railway Company has been completed at Mosby, four miles southwest of Excelsior Springs. Much work is also being done at other points. This line is backed by the Armour interests and will enter Kansas City over the new Armour-Swift-Burlington bridge. It is planned to eventually complete the line to St. Joseph, Mo.

LOGANSPORT, IND.—Eugene Purtell, promoter of the Indiana & Northwestern Traction Company, has applied for a franchise to enter this city and has interested the Commercial Club in his enterprise. The plan is to build an electric line from Chicago to Lafayette with a branch from Reynolds to Logansport. Mr. Purtell reported to the Commercial Club that he had completed the road from Chicago Heights to Mt. Ayr in Newton County, Indiana. S.

ST. PAUL, MINN.—The St. Paul Railway Promotion Company, which has been organizing the Southern Electric line, or the Lake Pepin line, has effected a combination with the Interurban Construction Company of Hastings. The Southern Electric Railway line was to have run from St. Paul through Hastings and Red Wing to Lake City. The Interurban Construction Company of Hastings meanwhile had begun work on a line from St. Paul through Hastings to Rochester, Minn. Both surveys will be used by the new company, which is to be known as the Interurban Construction Company.

DALLAS, TEX.—It is announced by J. F. Strickland, president of the Southern Traction Company, which is arranging to construct an interurban electric railway between Dallas and Waco, that the right of way has been secured from this city to the proposed terminus via Waxahachie and Hillsboro, also that the right of way for the line that is to run to Corsicana via Ferris and Ennis has been secured. The Stone & Webster Engineering Corporation of Boston, Mass., is back of this project, the Southern Traction Company being one of its subsidiaries. It is said to be the plan of this company to extend the line all the way through to Houston, where it will connect with the Galveston-Houston Interurban Electric Railway, the construction of which is now nearly finished. The latter line is also a Stone & Webster Corporation enterprise. The same interests own the interurban electric railway that runs from Dallas to McKinney. The line between Waco, the present projected southern terminus of the Southern Traction Company's line, and Houston, is through a region that is thickly populated, having many flourishing towns. D.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

GLENBURN, N. D.—The Lone Star Rural Telephone Company has increased its capital and will extend its lines. C.

CHOTEAU, MINN.—Work has been commenced on the installation of a telephone system for the forestry department. C.

DAYTON, WASH.—The Mount Vernon Telephone Company has been granted a franchise covering certain streets in this city. A.

ODESSA, WASH.—The Pacific Telephone & Telegraph Company has applied for a franchise for a telephone system in this town.

OLGA, ILL.—The Olga Telephone Company has been incorporated with a capital of $2,500, by Elwood Barker, S. E. Flannigan, Jr., and Lawrence Smith.

HAMILTON, MONT.—The Flathead Independent Telephone Company, capital $50,000, has been incorporated by A. H. Stephens, V. H. Calhoun and F. C. Wilhelm. C.

MANITOWOC, WIS.—The Illinois Tunnel Company, owners of the Chicago automatic-telephone system, is planning the installation of an automatic telephone system. C.

LAS CRUCES, N. M.—The Tri-State Telephone Company has been granted a franchise for a telephone system at Las Cruces. D. D. Clark is representing the company. A.

ASTORIA, ORE.—The Central Telephone Company has awarded a contract to Damon Stinson for stringing the wire for the line between this city and Jewell and Elsie.

PORTERVILLE, CAL.—The Rosedale Rural Telephone Company has been organized to install a system between Porterville and Worth. The main exchange will be located at Porterville. A. Chalmers is president, and E. O. Giddings, secretary. A.

BAY CITY, ORE.—The Pacific Telephone & Telegraph Company has commenced the reconstruction of its telephone exchange and system here. A trunk line will connect Bay City with Tillamook, and other county lines will terminate at Bay City. A.

EUGENE, ORE.—The Pacific Telephone & Telegraph Company will soon commence construction of a new line between Eugene and Cottage Grove. The company will also extend and improve its systems at Roseburg and Albany. About $75,000 will be expended in this work. A.

SHORT CREEK, KY.—The Short Creek Mutual Telephone Company has been incorporated with a capital of $2,000. The incorporators are D. M. Young, D. B. Young, S. T. Pryer, Isaac Ferry, S. H. Day, Willie Spurrier, John Bradshaw, J. M. White, S. J. Butler, Irvin Patterson, and others.

SANDUSKY, O.—Details have been worked out providing for the merger of the Independent and the Central Union Telephone Companies properties in Erie, Sandusky, Ottawa and Huron Counties. The consolidation will affect lines in Sandusky, Fremont, Port Clinton, Norwalk, Bellevue, Huron and Clyde. It is understood that all local business will go to the Independent concern and the long distance or toll business will go to the Central Union. About $500,000 stock will be represented in the independent company exclusive of Bell interests. The plan has been forwarded to the headquarters of each concern for ratification and the merger now seems assured. H.

ELECTRICAL SECURITIES.

The Western Power Company has filed a certificate with the secretary of state at Trenton, increasing its capital stock from $18,000,000 to $20,670,000.

The Massachusetts Railroad Commission has approved the issue by Boston Elevated of $5,000,000 thirty-year bonds, interest at a rate not to exceed five per cent. The entire issue has been subscribed for.

The American Telephone & Telegraph Company has offered stockholders of Missouri & Kansas Telephone Company the right to exchange until November 16, 1911, their stock for shares of American Telephone, at the rate of seven shares of Missouri & Kansas for three American Telephone & Telegraph. This works out at about fifty-five for Missouri & Kansas, which has paid no dividends for four years, and has recently sold around forty. There is $13,627,700 Missouri & Kansas stock outstanding. This company has been in a hotbed of opposition for years, but last year the American Telephone began its financial rehabilitation by canceling $10,000,000 Missouri & Kansas floating debt which it held, and taking in exchange Missouri & Kansas stock.

The management of the eight affiliated Hudson River Power Companies has been taken over from the receivers by the Stone & Webster Management Association, the properties having been deeded over the bondholders' committee headed by James R. Hooper of the New England Trust Company. This committee will in turn transfer them to the proposed new company to be incorporated under New York laws. It is understood that plans are being made for financing the reorganized company through a syndicate headed by Boston bankers.

DIVIDENDS.

Connecticut Railway & Light Company; regular quarterly dividends of one per cent on the common and one per cent on the prefered stocks, payable November 15.

Grand Rapids Railway Company, regular quarterly dividend of one and one-quarter per cent, payable November 1.

Minneapolis General Electric Company, a quarterly dividend of two per cent on the common stock, payable November 1 to stockholders of record October 18. This places the common on an eight-per-cent basis, the rate having been previously one and three-quarters per cent quarterly from August, 1910, to August, 1911, one and one-half per cent quarterly from November, 1909, to May, 1910, and two per cent semi-annually from 1906 to August, 1909.

North American Company, regular quarterly dividend of one and one-quarter per cent, payable January 2 to stock of record December 15.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK

NEW YORK.

	Oct. 23.	Oct. 16.
Allis-Chalmers common	3	3
Allis-Chalmers preferred	11	11
Amalgamated Copper	53⅜	52⅛
Amer. Tel. & Cable	*74	74
American Tel. & Tel.	134⅞	135¼
Brooklyn Rapid Transit	74½	75½
General Electric	150	150½
Interborough-Metropolitan common	14⅝	15⅛
Interborough-Metropolitan preferred	44	45½
Kings County Electric	129	129
Mackay Companies (Postal Telegraph and Cables) common	86	86
Mackay Companies (Postal Telegraph and Cables) preferred	72⅜	72½
Manhattan Elevated	134	134
New York & New Jersey Telephone	103	103
Pacific Tel. & Tel.	43	44
U. S. Steel common	59⅜	61⅛
U. S. Steel preferred	109½	109⅞
Western Union	78¼	79⅛
Westinghouse common	64½	63⅝
Westinghouse preferred	111	111

*Last price quoted.

BOSTON.

	Oct. 23.	Oct. 16.
American Tel. and Tel.	134⅝	135¼
Edison Electric Illuminating	285	286
General Electric	150	151
Massachuetts Electric common	20⅞	20⅛
Massachusetts Electric preferred	93	94¼
New England Telephone	145	145½
Western Tel. & Tel. common	26⅝	19½
Western Tel. & Tel. preferred	105	95

PHILADELPHIA.

	Oct. 23.	Oct. 16.
American Railways	44	44
Electric Company of America	11¾	11¾
Electric Storage Battery common	53	52¼
Electric Storage Battery preferred	53	52¼
Philadelphia Electric	16⅞	16⅜
Philadelphia Rapid Transit	23½	22⅜
Philadelphia Traction	83⅜	82¼
Union Traction	50⅞	50¾

CHICAGO.

	Oct. 23.	Oct. 16.
Chicago Elevated common	25	25
Chicago Elevated preferred	90	90
Chicago Railways, Series 1	92	92
Chicago Railways, Series 2	30¼	28
Chicago Subway	⅞	8
Chicago Telephone	121	119
Commonwealth Edison	127¼	127⅛
National Carbon comman	100	100
National Carbon preferred	117	117

PERSONAL MENTION.

W. H. NICHOLS, vice-president of the Allis-Chalmers Company, recently returned to New York from Milwaukee after a few days' inspection of the company's plant there.

JAMES K. GRAY has been promoted from the assistant-superintendency to the superintendency of the Chicago, Lake Shore & South Bend Interurban Railroad, to succeed C. E. Palmer. Mr. Palmer resigned to take a situation with the Ft. Wayne & Northern Traction Company.

E. R. BUCKLEY, after three years with the Wisconsin Geological Survey, seven years as director of the Missouri Bureau of Geology and Mines, and four years professional service as a mining expert, announces that he has opened an office as a consulting mining geologist and engineer at 1364 People Gas Building, 122 Michigan Avenue, Chicago, Ill.

GEORGE W. DUNLAP, superintendent of power of the Worcester (Mass.) Consolidated Street Railway Company, has sent in his resignation and will assume the position of electrical engineer for the New York Public Service Commission, First District. Mr. Dunlap's resignation takes effect November 1, at which time he will be succeeded by Frank M. Finlayson, now his assistant.

F. X. CLEARY has resigned his position as advertising manager for the Western Electric Company, to engage in special advertising and sales-promotion service. Mr. Cleary's long service as salesman, sales manager and advertising manager has given him a wide experience and acquaintanceship in the electrical field, which will continue to be his line of future effort. P. L. Thomson, formerly manager of the Western Electric Company's Pittsburg house, has been appointed advertising manager.

A. M. WORTHINGTON, actively connected with the electrical interests of Louisville, Ky., for the past twenty years, was on his recent resignation presented with a handsome gold watch by his employees and associates. Mr. Worthington's association in Louisville has been entirely in an executive capacity. He went to that city in 1891 as manager of the Citizens Electric Light & Power Company. Through all the changes and reorganizations which ended in the formation of the Citizens General Electric Company, he remained as general manager, and when that company was merged in 1903 with the Louisville Electric Light Company, forming the present Louisville Lighting Company, his services were retained. Mr. and Mrs. Worthington have gone to California, where Mr. Worthington will remain a year recuperating from an illness of some duration. He is succeeded as general manager by P. T. Glidden, who comes from Easton, Pa.

OBITUARY.

ROBERT MATHER, chairman of the Board of Directors of the Westinghouse Electric & Manufacturing Company, died Tuesday, October 24, after a short illness.

ROBERT MATHER.

Mr. Mather was born at Salt Lake City, Utah, on July 1, 1859, was graduated from Knox College in 1882, and at the time of his death he was a trustee of the college. In 1892 at Detroit he married Miss Alice Caroline Jell. He entered the railway service in 1882 and for three years was in the treasurer's office of the Chicago, Burlington & Quincy Railroad. In 1886 he was admitted to the Illinois bar in Chicago. He became general counsel of the Chicago, Rock Island & Pacific Railway in 1902 and its president in 1904. Mr. Mather had been chairman of the Board of Directors of the Westinghouse Company since 1909. He was a director of several railroads and of the National Bank of the Republic, Chicago, the Mercantile Trust Company of New York, the Equitable Life Assurance Society, and the Havana Electric Company. Mr. Mather's untimely death brings to a close a remarkable career. His successes were accomplished in his early life under great difficulties.

NEW PUBLICATIONS.

AMERICAN SOCIETY FOR TESTING MATERIALS.—This society has published the year book for 1911, containing the standard specifications which have been adopted by the society covering a variety of topics. These include magnetic tests of iron and steel, and specifications for hard-drawn copper wire. The charter and by-laws of the society and list of members are also given.

REPORT ON PROVIDENCE TRACTION.—This report arranged in a manner convenient for reference has a complete set of maps, diagrams and data regarding the traction situation in Providence, R. I. Financial questions are not taken up except in a general way, the object of the work done being to investigate the traction system as it exists, trace its previous development, and make recommendations for its physical improvement.

LEGAL NOTE.

CHARGING OFF OF COST OF UPKEEP.—The Third Appellate Division of the Supreme Court of New York holds that, while there are certain betterments to property that are properly chargeable to capital, the general upkeep of a plant ought not to be charged to capital, but the company ought to be compelled to make such repair and replacement as a part of current expenses. If this were not so, all running expenses could be capitalized periodically and the gross income called net income, and the company continually impoverished by paying improperly large dividends.—People ex rel. Binghampton Light, Heat & Power Company vs. Stevens, 128 N. Y. S. 440.

FOREIGN TRADE OPPORTUNITY.

(From Daily Consular and Trade Reports, issued by the Bureau of Manufactures, Washington, D. C. In replying to the Bureau for information mention file number.)

NO. 7440. AMERICAN TELEPHONE APPARATUS.—According to information supplied an American consulate by local dealers in telephones for private use and by hardware dealers, there should be a good opening for American telephone instruments, for both private and public installation. There is now a discussion relative to the advisability of extending the present system, now using Swedish instruments. This may afford Americans an opportunity to submit bids and receive the contract. The consulate in question would be glad to receive from telephone manufacturers, in addition to catalogues (preferably in Spanish), lowest prices, terms of credit, discounts, etc. Should any telephone manufacturer prefer to correspond direct with an especially interested person in the above line, the name of a resident is given, with whom correspondence may be conducted in Spanish or French.

PROPOSALS.

WIRING.—The office of the Supervising Architect, Washington, D. C., will receive proposals until November 10 for the construction complete (including heating apparatus, electric conduits and wiring, lighting fixtures), of the United States Post Office at Newberry, S. C., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Newberry, or at the Supervising Architect's office.

WIRING.—The office of the Supervising Architect, Washington, D. C., will receive bids for wiring and installing conduits and interior lighting fixtures in a number of post-office buildings, bids to close on the dates given below:

Date.	Post Office.
November 27	Huron, S. D.
November 29	Bloomington, Ind.
December 2	Parsons, Kans.
December 4	Homestead, Pa.
December 5	Union City, Tenn.

Drawings and specifications may be obtained from the custodian of the site at the various places where work is to be carried out, or from the Supervising Architect's office.

INDUSTRIAL ITEMS.

THE CENTURY ELECTRIC COMPANY, St. Louis, Mo., announces that Henry H. Thedinga, 343 Central Building, Seattle, Wash., has been appointed district sales agent to look after the increasing demand for Century single-phase motors in that territory.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., designates its October issue of *Trumbull Cheer* as the "Jovian Issue." In addition to an article on co-operation and another on Jovianism, there are several illustrations of starting switches and moulding receptacles reproduced.

THE DELTA-STAR ELECTRIC COMPANY, Chicago, Ill., has been awarded the contract for Columbian-type pole bases to be used in connection with the new flame-arc lamps supplied the City of Chicago by the Sanitary District. These bases are the product of the Pittsburgh Transformer Company's foundry and will be installed in the so-called Chicago loop district.

THE ILG ELECTRIC VENTILATING COMPANY, Chicago, Ill., has established a branch office at 13 Park Row, New York. The office, which is in charge of George Breidert, carries in stock a full line of direct-connected fans and blowers, including forge blowers, etc. The office solicits inquiries from architects, engineers, heating and ventilating men, electrical contractors and others, and is in a position to make immediate deliveries.

THE WAGNER ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., has distributed a bulletin describing its type BW polyphase induction motor. This motor represents an application of the mechanical features of the Wagner single-phase type to polyphase uses. The desirable starting and operating performance of the single-phase motor is thus secured. Curves showing the starting characteristics and performance of this motor are included.

STONE & WEBSTER ENGINEERING CORPORATION, Boston, Mass., has issued in the form of a booklet, a record of work done and work doing in the third quarter of 1911. The work is classified according to the states in which the work is done, and by the class of work. A summation shows 184,420 kilowatts steam installation, 271,150 kilowatts water-power development and 551 miles of railway construction. Also 83,825 kilowatts substation equipment was installed.

THE MINERALLAC ELECTRIC COMPANY, Chicago, Ill., has transferred the manufacture of the instrument formerly known as the Chicago printing attachment to the Chicago Electric Meter Company. The device will hereafter be known as the "Printometer" and will be manufactured under greatly improved conditions. The Minerallac Electric Company will, however, continue as distributers. The company further announces the removal of its offices from 400 South Hoyne Avenue to the Merchants Loan & Trust Building.

THE DONGAN ELECTRIC MANUFACTURING COMPANY, Detroit, Mich., has appointed Arthur P. Pierson, 136 Liberty Street, New York, as its sole selling and distributing agent for a complete line of bell-ringing, toy, Christmas-tree-lighting and sign-lighting transformers which are being placed on the market. Mr. Pierson has undertaken the marketing of the company's entire output. He is also selling a pull attachment for use on pull-chain sockets, known as the Peco attachment which may be used on any type of pull-chain socket and with any shade. A full line of artificial lamp colorings and permanent frosting liquids, also a line of soldering pastes, sticks and salts are being manufactured by Mr. Pierson and sold under his own trade-brand name, "Peco."

THE FOSTORIA GLASS SPECIALTY COMPANY, Fostoria, O., has issued catalogue No. 53, entitled "Iris Illuminating Glassware," in which are listed, described and illustrated over 300 different styles of shades and reflectors in colored and iridescent patterns for gas and electric lamps. It conforms in size of pages and general conception to the same company's 100-page catalogue No. 52 on cut and etched ware with the additional feature that each of the ten distinct motifs employed in the decorating of the "Iris" ware is realistically illustrated by a three-color cut. The colored plates bring out, so far as it is possible for cuts to do, the delicate shadings and blending tints which constitute much of the beauty of art glass, although it is not practical to reproduce through the medium of printer's ink, the play of iridescent colors that is characteristic of many of the types shown.

THE MOORE LIGHT COMPANY has made a number of installations in New York recently including long Moore-light tubes for the show windows of R. M. Haan at 505 Fifth Avenue and Madam Clarice at 1548 Broadway. New work has been completed in the Baltimore Dairy Lunch Rooms on Twenty-third Street and Beekman Street and in the Uptown Office of the New York World. The wholesale houses of Cheney Brothers, 215 Fourth Avenue, and Albert Godde, Bedin & Company, 13 West Twentieth Street, have been equipped with color-matching installations with the white Moore light. The fact that the white Moore light shows all colors in their true values has induced many textile manufacturers recently to utilize this form of illumination. These manufacturers include: Rhode Island Worsted Company, Stafford Springs, Conn.; J. H. & C. K. Eagle, Shamokin, Pa.; Cheney Brothers, South Manchester, Conn.; Footer's Dye Works, Cumberland, Md., and the American Thread Company, Willimantic, Conn.

THE WAVERLEY COMPANY, Indianapolis, Ind., has, in its 1912 catalog, embodied a new idea in catalog making. A number of scenes, incidents and characters from the Waverley novels, after which the Waverley Company was named, have been chosen for the decorative idea, and the scheme has been worked out in a most pleasing manner. Thus the outside cover displays in green and gold, figures in mediaeval armor taken from the entrance hall at Abbotsford. The inner cover shows Scott's coat of arms under a three-color picture of the Waverley 1912 limousine in the garden at Abbotsford. Across the tops of all the inside pages runs a frieze in three colors and gold representing the tournament in Ivanhoe. The portrait of Sir Walter Scott backs up the title page and in the wide margins on either side of the printed matter appear panel portraits of different Waverley characters. The two center pages of the catalog are devoted to a large four color half tone of a Waverley car on the Abbotsford estate. The catalog is well furnished with excellent engravings of the various types of the silent Waverley electrics.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, Pittsburgh, Pa., describes, in folder No. 4186, an auxiliary line switch for use on trolley cars equipped with ordinary drum type controllers. The auxiliary line switch is electro-pneumatically operated and is mounted underneath the car. The line current is broken by this switch, which is in effect a very rugged circuit-breaker. The folder contains a complete description and photographic illustrations of the line switch and wiring diagram showing how it should be installed. Folder No. 4184, dated September, 1911, describes the spider armature construction used by the Westinghouse Company, its railway-motor brush holders, its armature and axle bearings, and its unit switch control systems, both for 600 and 1,200 volts. Discussions are also given of the comparative advantages of interpole and non-interpole railway motors, and of box-frame vs. split-frame motors. Many photographic reproductions are given of modern interurban and street railway cars, and beside each is tabulated an outline specification for each car indicating the electrical and mechanical equipment used on it. Leaflet No. 2371 treats of the Type Q engine-driven, direct-current generators.

DATES AHEAD.

Telephone Pioneers of America. Boston, Mass., November 2-4.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, November 7-10.

Alabama Light and Traction Association. Montgomery, Ala., November 14 and 15.

Ohio Society of Mechanical, Electrical and Steam Engineers, Canton, O. November 17 and 18.

Association of Railway Telegraph Superintendents. Joint meeting of eastern and western divisions, Chicago, Ill., November 23 and 24.

Los Angeles Electrical Exposition. Los Angeles, Cal., November 25-December 9.

National Gas and Gasoline Engine Trades Association. Annual meeting, Hotel Hollenden, Cleveland, O., December 5-8.

American Institute of Chemical Engineers. Annual meeting, Washington, D. C., December 20-22.

National Electric Light Association. Next annual convention, Seattle, Wash., June 10-14, 1912.

National Electrical Contractors' Association. Annual meeting, Denver, Colo., July 17-20, 1912.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26, 1912.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) October 24, 1911.

1,005,794. TROLLEY. Stephen M. Balzer, Andover, N. J. Filed Oct. 28, 1907. A side-running trolley has the wheel rotating about a hollow bearing which is arranged to oscillate through a small angle about a flattened spindle that is thick in the middle and tapering off to the ends that are secured in the trolley fork.

1,005,797. TROLLEY GUARD AND FINDER. Henry E. Bayer, Pittsburg, Pa., assignor of one-fourth to Edward E. Rieck, Pittsburg, Pa. Filed June 13, 1910. The guard comprises arms mounted on the wheel journal and projecting upwardly and provided with pendulous portions to hold them vertical. The finding fork comprises divergent arms and a base portion arranged to have the trolley rope connected thereto, the fork being mounted on the wheel journal inside of the guard arms.

1,005,805. ADJUSTABLE SERIES SHUNT. Arthur J. Brown, Milwaukee, Wis., assignor to Allis-Chalmers Co. Filed Feb. 14, 1910. A strip of resistance material is wound back and forth in a frame forming loops, and has adjustable clamps for short circuiting one of the loops.

1,005,811. ELECTRICALLY HEATED COOKER. Lloyd G. Copeman, Flint, Mich. Filed May 7, 1910. A heat-insulating casing contais an electric heating unit that can be placed at the botton or top of the chamber. A thermostat regulates the heat.

1,005,829. ILLUMINATING DEVICE. William F. Gurley, Troy, N. Y., assignor to W. & L. E. Gurley. Filed Aug. 6, 1909. An electric lamp is arranged to illuminate a thermometer tube and its graduated scale.

1,005,842. ELECTROMOTOR. Benjamin F. Hutches, Jr., Allendale, N. J. Filed June 17, 1910. Comprises a centrally arranged stationary field magnet, a shaft journaled therein, a number of insulated wings secured to the shaft, armature coils carried by the wings, and means for conductively connecting any one coil with one of the adjacent wings.

1,005,846. ELECTRIC-WIRE-TERMINAL CLIP. Julius H. Kaesen, New York, N. Y. Filed Dec. 2, 1910. A threaded sleeve is adapted to screw over a terminal connector with an internal loop and screw to engage a wire and a pair of external gripping jaws that are closed as the sleeve advances along their inclined sides.

1,005,855. ALTERNATING-CURRENT ELECTROMAGNET. David L. Lindquist, Yonkers, N. Y., assignor to Otis Elevator Co. Filed June 16, 1909. Comprises a coil, a core formed of sections divided in planes parallel to the lines of force, and means for establishing magnetic flux of different phase relation respectively in the sections.

1,005,856. ALTERNATING-CURRENT ELECTROMAGNET. David L. Linquist, Yonkers, N. Y., assignor to Otis Elevator Co. Filed Feb. 9, 1910. Comprises primary and secondary coils, means for causing the magnetic fluxes due to their currents to differ in phase, and a selected ohmic resistance and a selected capacity external to the secondary and in series therewith.

1,005,857. ALTERNATING-CURRENT ELECTROMAGNET. David L. Linquist, Yonkers, N. Y., assignor to Otis Elevator Co. Filed Feb. 9, 1910. Comprises a primary coil, a stationary core, a movable core, and a secondary conductor on each of the cores.

1,008,858. DYNAMO-ELECTRIC MACHINE. Charles E. Lord, Norwood, O., assignor to Allis-Chalmers Co. Filed Sept. 24, 1906. A multipolar field structure is provided with regular field cores and poles, pole shoes divided in the center of each pole face, bridging members connecting adjoining poles, and a distributed auxiliary field winding arranged in slots in the pole shoes and bridging members.

1,005,862. PRINTING TELEGRAPH. Alfred S. McCaskey, Chicago, Ill. Filed May 3, 1901. Renewed Dec. 22, 1909. Combined with the signaling keys, are a number of sets of pole-changers, means for bringing these successively into operative connection with the keys, and a collector operated independently of the keys for connecting the sets of pole-changers successively with the line.

1,005,866. MEANS FOR PREVENTING AN ELECTRIC DISCHARGE THROUGH A GAS COLUMN. Daniel McFarlan Moore, Newark, N. J., assignor to Moore Electrical Co., New York, N. Y. Filed Apr. 7, 1906. Combined with a vacuum tube is a tube connected therewith and containing sand adapted to permit the passage of gas and prevent electric discharge therethrough.

1,005,867. VACUUM-TUBE LIGHTING. Daniel McFarlan Moore, Newark, N. J., assignor to Moore Electrical Co., New York, N. Y. Filed May 8, 1906. Combined with a vacuum tube are a number of gas feed valves controlling respectively the flow of gases different in kind, and independent operating magnets for the valves both responsive to changes in the vacuum within the tube.

1,005,870. DEVICE FOR SUPPORTING ARTICLES IN AN ELECTROPLATING BATH. Mortimer L. Packer, Columbus, O. Filed Feb. 3, 1911. A vertical metallic rod has a hook for hanging over a cathode bar, a sleeve for insulating the rod from the electrolyte and a series of hooks secured to the rod and passing through the sleeve for hanging the objects to be plated.

1,005,874. SPACER AND BRACER FOR COMMUTATOR-NECKS. Howard H. Ralston, Norwood, O., assignor to Allis-Chalmers Co. and Bullock Electric Manufacturing Co. Filed Aug. 1, 1907. Long commutator necks connect the commutator and windings, and spacing blocks are located intermediate the ends of the necks and engage the adjacent necks to prevent relative edgewise movement of the latter.

1,005,880. METHOD OF FORMING JOINTS IN METAL. Adolph F. Rietzel, Lynn, Mass., assignor to Thomson Electric Welding Co., Lynn, Mass. Filed Oct. 2, 1906. The method of securing a sheet-metal tube to a metal sheet provides the end of the tube with an annular flange having contacting projections projecting transversely to the flange, applying the flange to the surface with which union is to be formed, passing heating electric current through the contact projections and subjecting the parts to mechanical pressure applied in a direction transverse to the plane of the flange.

1,005,883. INSTRUMENT FOR MAKING MICROMETRIC MEASUREMENTS. Pierre Roch and Etienne Challet, Rolle, Switzerland. Filed July 28, 1910. A micrometer comprises a frame having fixed and movable fingers adapted to grasp an element to be measured between them, a micrometer screw for operating the movable finger, an electric circuit normally open, a latch adapted to be operated when the circuit is closed, such operation locking the micrometer screw against rotation and means co-operating with the micrometer screw for closing the circuit when the screw, the movable finger and the fixed finger are in their closest contact.

1,005,898. ILLUMINATED SIGN. Arthur W. Stahl and John H. Stahl, Denver, Colo. Filed Jan. 19, 1911. An electric sign with curved translucent sign plates has an electric lamp placed in a reflecting casing made of two partly open semi-cylindrical reflectors.

1,005,899. SWITCH. George G. Stout, Parkersburg, W. Va. Filed Sept. 26, 1907. A solenoid switch has a movable core adapted to raise the switch arm against a resilient contact plate.

1,005,902. ELECTRIC DROP LIGHT. Daniel H. Taylor, Palisades, Colo. Filed Dec. 28, 1910. Combined with a casing having an opening is a cord conductor passing out of the opening, a stand detachably connected with the casing, a lamp on the conductor, and means on the stand for detachably connecting the lamp to the stand.

1,005,904 and 1,005,905. SYSTEM OF ELECTRICAL DISTRIBUTION. Hermon L. Van Valkenburgh, Norwood, O., assignor to Bullock Electric Manufacturing Co. Filed Feb. 19 and 28, 1906. A number of generators that are to be connected in parallel have reciprocating double-throw volt-meter switches provided at the switchboard, so that in one position the volt-

meter is connected to the generator and when all the switches are in the opposite position the voltmeter is connected through them in series to the busbars.

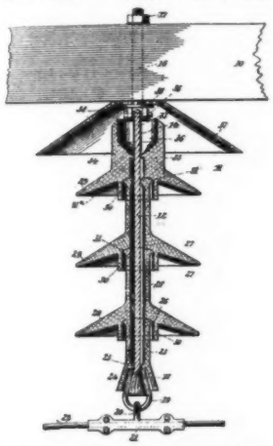
1,005,910. KEY SWITCH. Alfred H. Weiss, Chicago, Ill., assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Filed Mar. 23, 1905. A key switch for a party line consists of a set of spring-controlled keys adjoining each other in a row.

1,005,915. COIL-FORMING MACHINE. Alfred H. Wouters, Norwood, O., assignor to Allis-Chalmers Co. and Bullock Electric Manufacturing Co. Filed Feb. 28, 1907. Renewed Apr. 6, 1911. A coil-winding machine consists of a former, bending means, and means for moving the former in a polygonal path and for turning the bending means.

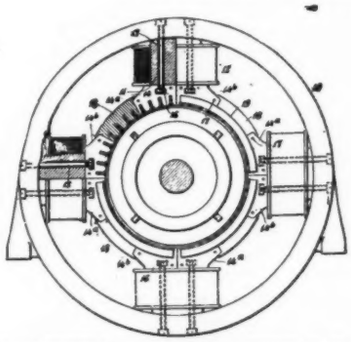
1,005,926. ELECTRIC SWITCH. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Co., Chicago, Ill. Filed July 18, 1907. A rotary snap switch inclosed in a canopy fixture.

1,005,937. SYSTEM OF ELECTRICAL DISTRIBUTION. Herbert W. Cheney, Milwaukee, Wis., assignor to Allis-Chalmers Co. Filed Oct. 6, 1909. A multi-wire power circuit has a circuit-breaker in each of its main wires. The circuit-breakers are interconnected by a tripping circuit containing coils normally keeping the circuit-breakers closed, a set of overload switches and auxiliary switches.

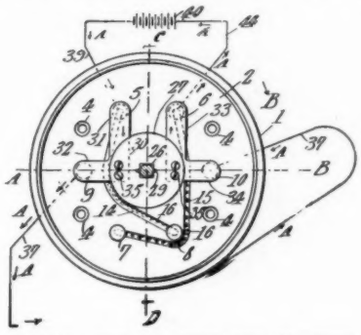
1,006,003. AUTOMATICALLY CONTROLLED MIXING-MACHINE OR THE LIKE. Pio Narciso Pecci, Paterson, N. J., assignor of one-sixth to Peter Dow, one-sixth to Herman Porzig, one-sixth to Charles Grund, and one-sixth to Richard Meyer, Paterson, N. J. Filed Apr. 5, 1911. The machine is driven by an electric motor which is electromagnetically controlled by a gear and dial associated with the machine.



1,006,041.—SUSPENSION INSULATOR.



1,008,858.—GENERATOR FIELD STRUCTURE.



1,006,140.—POLE-REVERSING SWITCH.

1,006,005. CIRCUIT-CLOSER. Franklin A. Pierce, Wheeling, W. Va. Filed Nov. 6, 1909. Between two oppositely disposed electromagnets is suspended a pair of oscillating arms carrying armatures. Attraction by one or the other magnet causes the arms to swing and thus close a set of contacts on one or the other side of the arms.

1,006,021. ELECTRIC LIGHTING. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Co. Filed Apr. 30, 1900. The method of modifying the color of mercury-vapor arc light and protecting the inclosure in which the same is contained consists in introducing vaporous color-modifying substances in a form in which their chemical activity with reference to the envelope is neutralized, and protecting the modifying substances from the action of moisture or of the atmosphere.

1,006,040. INSULATOR. Julius Alsberg, New York, N. Y. Filed July 29, 1907. Renewed June 13, 1911. A suspension-type insulator has its units suspended by strands of silicious material.

1,006,041. INSULATOR. Julius Alsberg, New York, N. Y. Filed Sept. 28, 1908. Renewed Feb. 24, 1911. The conductor is suspended by an insulating rope which is surrounded and protected by a series of interconnected petticoated tubular insulating units.

1,006,042. INSULATOR. Julius Alsberg, New York, N. Y. Filed June 17, 1909. Renewed June 13, 1911. A modification of the preceding.

1,006,069. ELECTROMAGNETIC IGNITING DEVICE FOR ARC LAMPS. Karl von Dreger, Berlin, Germany, assignor to Dagobert Timar, Berlin, Germany. Filed Feb. 15, 1910. A lamp with two pairs of carbon electrodes lying one above the other and almost horizontal has an electromagnetic short-circuiting device operatively connected to each upper carbon.

1,006,079. SUBMARINE SOUND-SIGNALING. John Gardner, Knott End, near Fleetwood, England. Filed Mar. 10, 1908. Includes an electromagnet operating a vibratory strip that controls two electrodes.

1,006,089, 1,006,090 and 1,006,091. ALTERNATING-CURRENT RELAY. Joseph F. D. Hoge, New York, N. Y. assignor to American District Telegraph Co. Filed Apr. 11, July 27 and Sept. 23, 1910. Associated with a pair of electromagnets is a vibratory armature that has a stationary node at an intermediate point adjoining a set of contacts. In the second patent the nodal point is adjusted by means of a dashpot containing oil. The third patent relates to the construction of the armature and contact points.

1,006,104. ELECTRIC HEATER. Robert Kuhn, Frank Kuhn, and Frank E. Shailor, Detroit, Mich., assignors to American Electrical Heater Co., Detroit, Mich. Filed June 11, 1910. Consists of flat V-shaped heating unit separable from the base. The vessel to be heated can be clamped above the heating unit.

1,006,112. PRINTING-TELEGRAPH SYSTEM. Alfred S. McCaskey, Chicago, Ill. Original application filed May 3, 1901. Divided and this application filed Dec. 22, 1909. The characters are distinguished by permutations of a number of impulses of opposite polarity. A distributer has a plurality of sets of distributing plates, each distributing the impulses representing a single character, and operating successively, whereby the impulses representing successive characters will be distributed to the receiving apparatus through different circuits. A receiving apparatus has sections corresponding in number to the sets of distributing plates, each section receiving the impulses of a single character from one of said sets of distributing plates.

1,006,129. COMBINATION ELECTRIC HEATER. Earl H. Richardson, Ontario, Cal., assignor to Pacific Electric Heating Co., Ontario, Cal. Filed Nov. 9, 1909. An electric iron is provided with a container which may be placed on the bottom of the iron when this is in an inverted position. Legs attached to a frame hold the iron in position. Legs, iron, and container are arranged to be conveniently packed. The heater may be used as an electric cooking utensil or as a flatiron.

1,006,140. POLE-REVERSING SWITCH AND WIRING SYSTEM. Oley R. Simenson and Olaf M. Simenson, Olympia, Wash. Filed Oct. 27, 1910. A disk provided with angularly disposed arms fixed to engage the terminals of the switch is turned with a stem.

1,006,148. ELECTRICAL SWITCH. Carlton L. Terry and Pitt Townsend, Cleveland, O. Filed Jan. 17, 1910. Combines a switch box having sockets therein opening through the wall of the box, connecting plugs adapted to fit into the sockets, a switch shaft extending through the wall of the box and provided with a handle, and a locking member carried by the shaft, outside of the casing, and engaging the plugs to lock the same in the sockets when the switch is closed.

1,006,192. ELECTRIC-WIRE CONNECTOR. Harold W. Forbes, Glastonbury, Conn. Filed Mar. 21, 1911. Comprises a wire-conducting tube, a socket member having conducting pipes for the tube, the socket member comprising a pair of sections. Means are provided for securing the sections upon the tube, and for controlling the rotation of the sockets when upon the tube.

1,006,193. ELECTRIC SWITCH. Harry J. Ford, San Quentin, Cal., assignor of one-half to William John Hill. Filed Apr. 18, 1911. Opposed electromagnets open and close the switch, separate locking bolts respectively holding the switch in open or closed position. Circuit-closing means are associated with the bolts, and separately controlled electrical means are supplied for releasing each bolt and closing the associated circuit-closer to connect one of the electromagnets to open or close the track switch.

1,006,198. SEAL FOR SECTIONAL LEADING-IN WIRES. Theo-

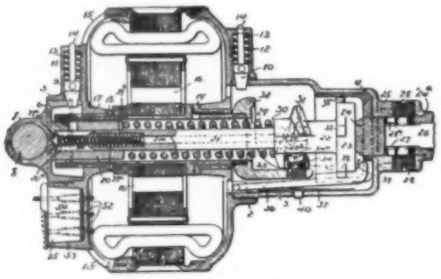
dore W. Frech, Jr., Cleveland, O. Filed Jan. 10, 1907. Renewed Sept. 8, 1911. Sections of dissimilar metal are joined together, the joints between sections having the same cross-section area as that of the largest component section. A sealing material incloses each sectional leading-in wire.

1,006,232. SHOCK-ABSORBER FOR CHANDELIERS. Henry C. Kraushaar, St. Louis, Mo. Filed Feb. 1, 1911. The weight of the chandelier rests upon a coiled spring which is held between two collars.

1,006,233. REMOVABLE COIN-ACTUATED APPARATUS FOR USE WITH ELECTRICITY-METERS. Karl Kretz, Strassburg, Germany. Filed Apr. 22, 1910. A lever weighted at one end and having its other end passing through a slot in the channel wall is adapted to be depressed by the passage of a coin and to be formed into a position where it may be engaged by the recess of a rotary disk. An axle upon which the lever is mounted is adapted to turn when said lever is actuated, and means are associated with the axle for closing an electric circuit.

1,006,235. POLICE SIGNALING AND CONTROLLING SYSTEM. Charles C. Lamb, Chicago, Ill., assignor to Bennett Hallenstein, Chicago, Ill. Filed Oct. 5, 1909. A chart at the central office indicates the position of each patrolman. Indicating members move over the chart in paths corresponding to the paths traveled by the patrolmen.

1,006,244. EXPLOSIVE ENGINE. Abbot A. Low, Horseshoe, and Harry Hertzberg, New York, N. Y.; Hertzberg assignor to Low. Filed Oct. 12, 1907. The vaporizer is heated by an electric heating coil wound on the metallic box or casing into which the fuel is sprayed.



1,006,339.—ROCK DRILL.

1,006,268. INSULATOR-BRACKET. Charles L. Peirce, Jr., Pittsburgh, Pa., assignor to Hubbard & Co., Pittsburgh, Pa. Filed Oct. 26, 1910. The insulator bracket arms are pivoted between two angle irons which may be bolted to a support.

1,006,296. ELECTRIC SWITCH. Frank E. Seeley, Bridgeport, Conn., assignor to Bryant Electric Co., Bridgeport, Conn. Filed May 19, 1911. An adjustable abutment at one end of the ratchet spring allows of regulation of the tension of the spring. All adjustments may be made from the lamp-receiving end of the socket.

1,006,303. TROLLEY WHEEL. Albert C. Sloan, Salamanca, N. Y. Filed Mar. 6, 1911. The wheel is held in position by two hollow truncated cones having inwardly projecting hubs around their smaller ends and axially projecting flanges around their larger ends. A nut secured on one end holds the cones and wheel in place.

1,006,322. ELECTRIC ALARM CLOCK. Elbert R. Weaver, Homosassa, Fla. Filed Feb. 15, 1911. Light and signal circuits are closed by the hand of a clock which is provided with a contact.

1,006,333. VAPOR ELECTRIC LAMP. Howard I. Wood, Schenectady, N. Y., assignor to General Electric Co. Filed Feb. 14, 1903. A conductor permanently connects the electrodes making light contact with the vaporizable electrode, and connecting also with a co-operating electrode.

1,006,339. ROCK DRILL. Thomas Edgar Adams, Cleveland, O. Filed Aug. 12, 1908. The drill shaft is rotated by an electric motor incorporated in the tool. This shaft extends through a sleeve in the motor axle, a spring and a cam being so arranged as to cause the drill to pound while the motor is in operation.

1,006,344. PRINTING-TELEGRAPH. Manuel S. Ayau, New York, N. Y. Filed Nov. 14, 1907. Typewriter mechanism on a single main-line circuit has a number of keys, one of which prints each character. The sending mechanism has the same number of keys, the depression of each one causing a particular fixed number of comparatively weak impulses to be sent out. Following these a stronger impulse is sent. Thus the weak impulses act to select the key at the receiving end and the stronger one actually operates the type bar.

1,006,382. OVERHEAD TROLLEY. James H. Howard, Kansas City, Kans. Filed Nov. 10, 1908. A dog is pivoted to the base of the trolley pole and pivotally linked to the lower end of the rod, a spring tending to slide the rod upwardly to cause the dog to engage the ratchet-bar.

1,006,394. ELECTRIC PUSH-BUTTON. Jackson Lee Morrell, New York, N. Y. Filed June 9, 1911. The button pushes against a spring which is bent in the form of a loop. When the button is pushed a wedge-shaped projection makes contact with a stationary projection fixed on the base plate and connected in the other side of the circuit.

1,006,395. CIRCUIT-CLOSING DEVICE. Worthington E. Morton, Shelby, N. C. Original application filed Oct. 11, 1909. Divided and this application filed Feb. 14, 1911. Comprises a stop motion adapted to be automatically operated by the closing of the circuit of a machine adapted to receive its work in the form of a continuous lap, the machine including a pair of electrical conductive lap rolls forming the terminals of the electric circuit and an electric conductive lap spool supported by the rolls.

1,006,415. ELECTRIC GARMENT. Arthur C. Stubling and Foster C. Gibson, Portland, Ore. Filed Jan. 30, 1911. Electric heating coils properly insulated are spaced in the lining of the garment, and means are furnished for cutting out part of the coils when the heating effect is too great.

1,006,421. VAPOR ELECTRIC LAMP. Howard I. Wood, Schenectady, N. Y., assignor to General Electric Co. Original application filed Feb. 14, 1903. Divided and this application filed Jan. 23, 1904. Has one electrode made of vaporizable material, the initial flow of current entering the vaporizable material through a poor or relatively high-resistance contact, so as to generate ionized vapor at said contact, thereby causing the main discharge to take place between said electrodes.

1,006,429. APPARATUS FOR TRANSMITTING SOUND-WAVES. Fred Harvey Brown, Los Angeles, Cal., assignor to National Electric & Magnetic Co. Filed Apr. 17, 1907. Consists of a source of direct-current generation, a magnetic coil for generating extra-direct currents and a microphone in circuit therewith, a line circuit superimposed on the windings of said coil, a magnetic wave-transforming coil in series with the line circuit comprising a transmitting station, in combination with a similar or suitable set and arrangement of devices at a distant point comprising a receiving coil having a telephone receiver in series with its windings at a distant point from the transmitting station.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired October 23, 1911:

527,776. ELECTRIC MOTOR OR DYNAMO. Cornelius F. Daniels, Macon, Ga.

527,786. SELF-WINDING ELECTRIC CLOCK. Emil G. Hammer, Brooklyn, N. Y.

527,788. ELECTRIC UTERINE BATTERY. Charles E. Hebard, Grand Rapids, Mich.

527,826. CARBON FOR ELECTRIC LIGHTS. Edward G. Acheson, Monongahela City, Pa.

527,857. TRANSFORMER SYSTEM FOR ELECTRIC RAILWAYS. Maurice Hutin and Maurice Leblanc, Paris, France.

527,861. METHOD OF MANUFACTURING ELEMENTS OR PLATES FOR SECONDARY BATTERIES. Hugh F. Kilpatrick and Nenry Thame, London, England.

527,873 and 527,874. CLOSED-CONDUIT ELECTRIC RAILWAY. James F. McLaughlin, Philadelphia, Pa.

527,901. ELECTRIC-ARC LAMP. Hans O. Swoboda, New York, N. Y.

527,922. ELECTRIC BELT. Jonas Backstrom and Frank W. Johnson, Stroudsbourg, Nebr.

527,927. ELECTRIC MOTOR FOR RAILWAY-CARS. Norman C. Bassett, Lynn, Mass.

527,958. ELECTRIC SIGNALING SYSTEM. Bradley A. Fiske, U. S. Navy.

527,989. COMBINED REGULATING INCANDESCENT LAMP AND SOCKET. Charles A. Hussey, New York, N. Y.

527,990. ELECTRIC AND GRAVITY PLEASURE RAILWAY. Charles A. Idler, Atlantic City, N. J.

528,014. ELECTRIC SWITCH. James F. McLaughlin, Philadelphia, Pa.

528.021. ELECTRIC-LIGHTING SYSTEM. George J. Parfitt and George T. J. Parfitt, Keynsham, England.

528,040. TELEPHONE CIRCUIT AND SIGNAL. Theodore Spencer, Cambridge, Mass.

528,053. MAGNETIC SEPARATING-MACHINE. William H. Williams, Newark, N. J.

528,054. MAGNET SEPARATOR. William H. Williams, Newark, N. J.

528,075. COMBINED TELEPHONIC AND SIGNALING SYSTEM. Henry A. Chase, Boston, Mass.

528,121. ALTERNATING-CURRENT MOTOR. Charles T. Child, Ashland, Va.

528,119. ELECTRIC-ARC LAMP. Sigmund Bergmann, New York, N. Y.

528,127. CIRCUIT-HANGER FOR ELECTRIC SIGNALING SYSTEMS. John F. Hunter and Samuel H. Lough, Seattle, Wash.